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S. HRG. 100-459

METHANOL AND ALTERNATIVE FUELS PROMOTION ACT OF 1987

P16-23

CIS RECORD ONLY:

HEARING

BEFORE THE

SUBCOMMITTEE ON THE CONSUMER

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDREDTH CONGRESS

FIRST SESSION

ON

S. 1518

TO AMEND THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT TO PROVIDE FOR THE APPROPRIATE TREATMENT OF METHANOL AND ETHANOL, AND FOR OTHER PURPOSES

NOVEMBER 12, 1987

Printed for the use of the
Committee on Commerce, Science, and Transportation

STANFORD UNIVERSITY
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METHANOL AND ALTERNATIVE FUELS PROMOTION ACT OF 1987

THURSDAY, NOVEMBER 12, 1987

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
SUBCOMMITTEE ON THE CONSUMER,
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:35 a.m. in room 562, Dirksen Senate Office Building, Hon. John D. Rockefeller IV presiding.

Staff members assigned to this hearing: Kevin Curtin, staff counsel; and Alan Maness, minority staff counsel.

OPENING STATEMENT BY SENATOR ROCKEFELLER

Senator ROCKEFELLER. The hearing will come to order.

We will have a moderately bifurcated meeting this morning in that we have several who are on their way from the airport, several people who we hope are on their way from an airport, hopefully in this city, and then we have a vote. Senator Wilson has changed his entire California schedule in order to make an appearance here, so when he comes I want to recognize him on the spot.

This bill, S. 1518, really is important, and I think that it has a tremendous amount of potential momentum. It amends the Motor Vehicle Information and Cost Savings Act to provide appropriate treatment, in this Senator's judgment in any event, for methanol, ethanol and natural gas vehicles. This effort, as Senator McCain mentioned, started with Senator Danforth in 1985, and the bill that he introduced at that time in fact went through the Commerce Committee. It also had the purpose of stimulating and accelerating the manufacture of methanol and ethanol and natural gas fueled vehicles, and then in turn, of releasing the so-called fuelling and production cycle that we would hope follows after the chicken and egg syndrome is broken.

Senator Danforth led the Commerce Committee to adopt that earlier version of this bill, and since that time there have been a lot of discussions about this bill. There has been a lot of tailoring to try to figure out how to best tailor the incentives within the context of the existing fuel economy laws.

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I think we have addressed a lot of issues that have been raised by people, and as a result, quite frankly, the bill has been made more complex. It is a more difficult bill for some to understand. And we may yet need to tinker a bit under the hood, so to speak.

In any event, I am hopeful that we will move quickly towards a markup. The bill is supported now, as Senator McCain knows, by a broad variety of Senators, both in terms of regions and in terms of party. To date we have 25 Senators who have joined me in cosponsorship, including now I guess 11 or 12, clearly more than a majority, of the Commerce Committee. Senators Gore and Inouye are now also cosponsors of this bill.

I have suggested this legislation, as Senator McCain knows very well, because this country is on an unhealthy trip in terms of its fuels policy. We are now feeding off of gasoline which comes from oil. I thought, and I think we all thought, that in the 1970s we learned a painful lesson about price and about stability and supply. We at that time, I thought, vowed not to repeat our mistakes. We did not want to see disruption, and we wanted to develop alternatives. We made grand national pledges, and we did not do much. We talked about making fuels from grains, from natural gas, from coal, and there was a lot of talk and not a great deal of action as a result of that talk.

We do have relative stability now of oil prices, of energy prices, and that has been true for some period of months. Most people do not speculate that will remain true past the end of this decade or into the beginning of the next decade. In any event, that stability of price should not in any way fool us into thinking that the search for energy alternatives has made much progress or has been completed.

There has been some progress on conservation, but there has been precious little progress toward developing transportation fuel replacements.

Alternative fuels also give us, obviously, a tremendous opportunity to look at not only our energy security difficulties, but also ozone and smog formation, particularly in urban areas. The deadline for the clean air sanctions is approaching; every mayor, every county commissioner knows that. It is approaching by the end of this year. Policymakers recognize there are very few options available now to do much about the instance of unhealthy air.

Promoting the development of alternative fuel vehicles will very much help clean up air and will very much help us on our transportation mix in terms of fuels, and it is an all win proposition.

Finally, I might say, not at all incidentally, that I fervently believe that this has enormous impact in terms of jobs in our country. Now, that is not impact right away; that is not impact in 1989 or 1990, and not even a huge impact at the time that the first flexible fuel vehicle, if all of this happens, rolls off the production line in some quantity. But the coal industry, the natural gas industry, the grain industry have an enormous amount to look for in terms of jobs for people in my part of the country, in West Virginia and Appalachia, in the midwest, in Alaska, anywhere where natural gas, coal or grain is produce. We must

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try to bring some of these fuel producing jobs back home to America where they belong. These jobs will not be created early, but they will be created. They will happen.

In order for us to have the chance of their happening, we have to make this first step.

Momentum is building. The House has good momentum. The States, California, for example, have spectacular momentum, as do other countries. Japan has substantial momentum in this matter of alternative fuels, and we must seize on this opportunity.

There will be those who will say that this bill does not do enough, does not go far enough. Others will say it goes too far. Well, a journey of 1000 miles begins with a single step, and we have to take that step. This bill is fundamental in breaking the chicken and egg cycle which prevents people from producing flexible fuel vehicles, which in turn prevents those who would supply the fuel from doing so, which in turn makes it impossible for the consumers to consider it at the present time. We have to break the cycle.

So somebody starts. This bill does that, and I think it does it properly. As Senator McCain said, it does it without cost to the public treasury because it is not a give-away, it is an incentive, and it still relies on free market systems.

Now, having said that, I am not a member of this subcommittee, and therefore, since I am a duly deferential Senator, we are going to start this hearing off with any comments that the Ranking Member of the subcommittee, Senator McCain, might wish to make.

OPENING STATEMENT BY SENATOR McCAIN

Senator McCAIN. Thank you, Mr. Chairman, and I will try to be brief, but I just want to express my deep appreciation for you for the leadership that you have displayed on this issue. I think that it is clear that we would not be where we are if it had not been for the years of effort that you and Senator Danforth have taken, and I am very appreciative and privileged to be a cosponsor of the Methanol and Alterative Fuels Promotion Act. Not only could it help ease the energy crisis our nation faces, it could help protect our precious environment while preserving growth.

The latest estimates from the EPA indicate that 62 metropolitan areas are in noncompliance with its ozone pollution standards. In addition, 65 metropolitan areas have carbon monoxide levels exceeding EPA standards.

Mr. Chairman, as you well know, no part of the country is immune from these problems. In my home State of Arizona, people used to move there in order to get away from pollution, to ease their respiratory problems, and unfortunately, times have changed. Last year Phoenix had a greater number of days with carbon monoxide in excess of EPA standards than did New York City. Currently Phoenix is in nonattainment status for carbon monoxide and ozone. Tucson has also had this dubious distinction in the past, and may well again in the future.

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To ensure the health of our citizens and the continued growth of my home State of Arizona, we need to control air pollution, and I believe that this legislation that you have initiated will go a long way in that direction. I believe that mobile sources play, if not the largest, then certainly a very significant role in this problem. Alternative fuels are among the tools that local communities can use to lessen the impact of mobile source pollution. Methanol and other alternative fuels can substantially reduce ozone and carbon monoxide pollution because they burn clearer and cleaner than gasoline.

Mr. Chairman, the Methanol Alternative Fuels Promotion Act can stimulate the use of alternative fuels without the expenditure of any tax dollars. It is an idea whose time has come, and I am hopeful that this subcommittee and the full committee will be able to move quickly to report the bill to the Senate.

Thank you, Mr. Chairman.

Senator ROCKEFELLER. Thank you, Senator McCain.

I might say that when I was three years old I moved to Tucson for a year for precisely the reasons that you described, trying to get rid of asthma.

Could I not move back there now?

Senator MCCAIN. There are parts of Arizona, Mr. Chairman, but I am afraid I could not recommend either exactly at this time, but there are a few other areas like Flagstaff and Yuma and others that I think would certainly welcome you back.

Senator ROCKEFELLER. I will be there.

I think this is going to be a very good hearing, and I am very happy about it.

Obviously I am extremely grateful to Senator Hollings and to Senator Gore, and each of them have statements which at this point I enter into the record, for not only making this hearing available, but also making it available expeditiously.

[The statements and bill follow:]

OPENING STATEMENT BY THE CHAIRMAN

I am pleased that the Consumer Subcommittee is holding this hearing to consider the issue of alternative fuel powered automobiles. I have always subscribed to the notion that if you can build a better mousetrap, the world will beat a path to your door. I also believe that our free enterprise system affords the people of our nation the opportunity to design, build and market that better mousetrap.

Over the years, I have supported the development of alternative fuels. In 1980, I introduced the Methane Transportation Research, Development, and Demonstration Act of 1980, which ultimately became public law. That bill authorized certain activities to advance the use of methane as a fuel substitute. Since then, the advantages of methanol as an alternative fuel have become even more clear, and other alternative fuel sources have emerged as well.

However, innovation may need a bit more of a boost from the Federal Government. That's why we're here today. Many people believe that the incentives to automobile manufacturers which are provided in S. 1518 will lead to the design and production of automobiles capable of running on fuel other than gasoline.

We don't need to look back to the energy crisis in 1973 to see that it would be far better for America to develop its own energy sources than to continue to rely on foreign sources. The current uncertainties in the Middle East and encounters involved

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in the movement of oil tankers in the Persian Gulf speak all too clearly of the dangers inherent in our dependency on foreign oil. Since the 1973 Arab oil embargo, the Federal Government has played a very significant role in bringing about greater automobile fuel economy. I was an early and strong supporter of legislation on fuel economy. If alternative fuels can take us further down the road toward energy independence, it is important that we know what Congress can do to help.

In addition, development of alternative fuel powered automobiles may improve our nation's balance of trade and balance of payments through reduced oil imports. As the conferees on the trade bill continue to meet, we are reminded of the difficulties in setting and implementing effective trade policies for the United States.

Finally, S. 1518 would provide incentives for action by private industry without costing the American taxpayer any revenues. It would do this without significant environmental impacts from the use of alternative fuels; in fact, methanol burns cleaner than gasoline.

For all these reasons, I am pleased that we are holding hearings on this important issue. I look forward to the testimony of today's witnesses.

OPENING STATEMENT BY SENATOR GORE

Mr. Chairman, I express my support for the Methanol and Alternative Fuels Promotion Act of 1987. This legislation provides an incentive for automakers to invest in and mass produce alternative fuel vehicles by adjusting corporate average fuel economy standards for vehicles capable of using alternative fuels.

I applaud Senator Rockefeller's approach in encouraging the development and promotion of alcohol fuels. At current rates, imports of foreign oil are expected to exceed 50 percent of U.S. totals in the early 1990s. Meanwhile, the transportation sector drains more than 60 percent of our oil consumption. To avoid reliance on foreign energy sources, we must craft a comprehensive energy policy, and one key is to invest in alternative and renewable energy research and development.

Unfortunately, the current Administration has failed to plan for a secure energy future and has completely neglected to design a coherent energy policy. This year, the Administration's budget request would have slashed Department of Energy spending on solar and other renewables by 40 percent. That lack of leadership has again put us in a precarious position in relation to OPEC. Although present low oil prices do not create economic incentives for commercial investment in alternative and renewable energy sources, we need to plan for a time when oil prices will rise and we will need alternatives.

The federal government must encourage the development and use of alternative fuels. Problems with distribution and technical problems would be ameliorated with federal assistance .nd cooperation. However, I do not believe that the federal government should usurp the role of cities and states in determining the correct approach to certain problems like air pollution control. For example, Denver's oxygenated fuels mandate will alleviate that city's carbon monoxide problems and help it comply with Environmental Protection Agency (EPA) guidelines.

Alternative fuels like methanol and ethanol promise us clean and abundant energy for our transportation needs. If we produce methanol from coal, we can tap into this nation's most plentiful fossil fuel. However, without distribution networks for these fuels, automakers have been reluctant to produce on a large scale vehicles that can accept alternative fuels. S. 1518 would encourage automakers to develop and produce alternative fuel cars—methanol, ethanol, natural gas—by adjusting fuel economy standards for these fuels.

While expanding energy sources, we must provide adequate environmental protection. Both ethanol and methanol reduce carbon monoxide and ozone emissions, helping cities attain Environmental Protection Agency standards for clean air. Yet, we must also be aware of any increased emissions from the use of alternative fuels. For example, if aldehyde emissions are projected to be a problem, the EPA should impose strict standards.

Obviously, as we seek to stimulate alternative fuel uses, we must also be sensitive to budget implications. While tax incentives for alternative energy development may be necessary in the future, this bill seeks no such tax expenditures.

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I wholeheartedly believe we should encourage further development of alternative fuels. That is why I am cosponsoring the Methanol and Alternative Fuels Promotion Act of 1987. Vehicles that can operate on methanol, ethanol, and natural gas promise to enhance our energy security by reducing our dependence on foreign energy sources. If we can foster an alternative fuels industry and encourage development of alternative fuel vehicles, we can position the United States for a more secure, more prosperous future.

100TH CONGRESS
1ST SESSION

S. 1518

To amend the Motor Vehicle Information and Cost Savings Act to provide for the appropriate treatment of methanol and ethanol, and for other purposes.

IN THE SENATE OF THE UNITED STATES

JULY 21 (legislative day, JUNE 23), 1987

Mr. ROCKEFELLER (for himself, Mr. DANFORTH, Mr. WILSON, Mr. WIRTH, Mr. CRANSTON, Mr. BYRD, Mr. JOHNSTON, Mr. DASCHLE, Mr. KASTEN, Mr. LUGAR, Mr. MCCAIN, Mr. BINGAMAN, Mr. EXON, Mr. DIXON, and Mr. MOYNIHAN) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

---

A BILL

To amend the Motor Vehicle Information and Cost Savings Act to provide for the appropriate treatment of methanol and ethanol, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Methanol and Alternative Fuels Promotion Act of 1987".

FINDINGS

SEC. 2. The Congress finds that—

(1) transportation uses account for more than 60 percent of the oil consumption of the Nation;

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(2) continued reliance on imported oil is detrimental to the economy and security of the United States;

(3) methanol, ethanol, and natural gas are proven transportation fuels that burn more cleanly and efficiently than gasoline; and

(4) conversion of a portion of the transportation fleet of the Nation to methanol and alternative fuels would stimulate development of a domestic coal-to-methanol and methane industry, create jobs, reduce air pollution, and enhance national security.

PURPOSES

SEC. 3. The purposes of this Act are to—

(1) provide for the appropriate application of fuel economy standards to methanol, ethanol, and natural gas powered passenger automobiles and dual fuel passenger automobiles; and

(2) increase the use of methanol, ethanol, and natural gas by consumers and the production of methanol, ethanol, and natural gas powered passenger automobiles.

MANUFACTURING INCENTIVES FOR AUTOMOBILES

SEC. 4. (a) Section 501 of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2001) is amended—

(1) in paragraph (1), by inserting immediately after "fuel" the first time it appears the following: ",

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methanol mixture, ethanol mixture, or natural gas"; and

(2) by adding at the end thereof the following new paragraphs:

"(15) The term 'methanol mixture' means the mixture of methanol with other fuel, if any, used to operate a methanol powered passenger automobile.

"(16) The term 'methanol powered passenger automobile' means an automobile designed to operate on not less than 85 percent methanol.

"(17) The term 'ethanol mixture' means the mixture of ethanol with other fuel, if any, used to operate an ethanol powered passenger automobile.

"(18) The term 'ethanol powered passenger automobile' means an automobile designed to operate on not less than 85 percent ethanol.

"(19) The term 'natural gas' means either natural gas mixture, or any mixture of natural and artificial gas.

"(20) The term 'natural gas powered automobile' means an automobile designed to operate on natural gas.

"(21) The term 'dual fuel passenger automobile' means an automobile which—

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"(A) is capable of operating on methanol or ethanol and which is designed to make instantaneous adjustments to the air-fuel ratio for the entire range of mixtures (from 0.0 percent methanol or ethanol to at least 85 percent methanol or ethanol, as appropriate) of gasoline and methanol or ethanol, or is capable of operating on natural gas or gasoline;

"(B) achieves a driving range of at least 250 miles, based upon the combined EPA city/highway fuel economy, as determined for average fuel economy purposes for such automobile when operating on an 85 percent methanol mixture; and

"(C) achieves a driving range of at least 250 miles, based upon the combined EPA city/highway fuel economy, as determined for average fuel economy purposes for such automobile when operating on an 85 percent ethanol mixture.

The driving range for dual fuel passenger automobiles operating on such methanol mixture or ethanol mixture specified in this paragraph may be lowered by the Secretary after a rulemaking proceeding, if the Secretary determines, as a result of such proceeding, that such dual fuel passenger automobiles cannot be redesigned to achieve such driving range, considering economic

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feasibility, safety, and other factors determined by the Secretary to be relevant, but in no event shall the Secretary lower such requirement below 200 miles, based upon the combined EPA city/highway fuel economy.".

(b) Section 502(l)(1) of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2002(l)(1)) is amended—

(1) by redesignating subparagraph (E) as subparagraph (H); and

(2) by inserting immediately after subparagraph (D) the following new subparagraphs:

"(E) As specified in this subparagraph, for any 10 consecutive model years between 1993 and 2005, a manufacturer of dual fuel passenger automobiles shall receive an average fuel economy increase in accordance with section 503(d)(4)—

"(i) for the initial five model years, up to 1.2 mile-per-gallon or an average fuel economy increase based on 200,000 dual fuel passenger automobiles, whichever is higher, but in no event shall such average fuel economy increase be greater than 1.5 miles-per-gallon; and

"(ii) for the period of five years after the initial five model years, up to 0.9 mile-per-gallon or an average fuel economy increase based on 200,000 dual fuel passenger automobiles, whichever is higher, but in no event shall such average fuel economy increase be

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greater than 1.1 miles-per-gallon. Not later that January 15, 2000, the Secretary shall, in consultation with the Secretary of Energy and the EPA Administrator, complete a study with respect to whether the increases specified in this subparagraph should be extended for not to exceed five model years. The Secretary shall include in such study recommendations regarding such increases, and shall transmit to the Congress the results of such study. If the Secretary determines that such increases should be extended, the Secretary shall, within 60 days after the completion of such study, promulgate a rule providing for such increases. No such rule shall take effect for a period of 90 days after the study is transmitted to the Congress under this subparagraph.

"(F) Notwithstanding the provisions of subparagraph (E) of this paragraph, if the Secretary reduces the average fuel economy standard for any model year below 27.5 miles per gallon, the average fuel economy increase to which any manufacturer of dual fuel passenger automobiles would otherwise be entitled under this subsection in any model year shall be reduced by the amount of the reduction in the average fuel economy standard, except that any manufacturer of dual fuel passenger automobiles which qualifies for a credit under subparagraph (E) shall receive an average fuel economy increase

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of at least 0.7 mile-per-gallon. No such credit earned under subparagraph (E) may be used under subparagraph (C) unless the manufacturer of such dual fuel passenger automobiles has achieved a minimum average fuel economy in such year no lower than the minimum level specified in subsection (a)(4). In determining a manufacturer's minimum average fuel economy, dual fuel passenger automobiles manufactured by a manufacturer shall be determined as if such automobiles were operated exclusively on gasoline.

"(G) Notwithstanding any other provision of this paragraph, a manufacturer of natural gas powered automobiles or dual fuel passenger automobiles when operated on natural gas specified in section 501(21)(A) shall not be entitled in any particular model year to earn a credit under this subsection if the Secretary of Energy determines, and notifies the Secretary, that entitling such manufacturer to earn such a credit is likely to result in a significant increase in the average price to gas consumers of natural gas.".

(c) Section 503(d) of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2003(d)) is amended by adding at the end thereof the following new paragraphs:

"(4)(A) If a manufacturer manufactures methanol or ethanol powered passenger automobiles or dual fuel passenger automobiles, the fuel economy of an automobile shall be based on the fuel content of the methanol or ethanol mixture

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used to operate such automobiles. For purposes of this section, a gallon of the methanol or ethanol mixture used to operate such automobiles shall be considered to contain 15 one-hundredths of a gallon of fuel.

"(B) If a manufacturer manufactures dual fuel passenger automobiles, the fuel economy of an automobile shall be based on the fuel content of the methanol or ethanol mixture used to operate such automobiles. For purposes of this section, a gallon of the methanol or ethanol mixture used to operate such automobiles shall be considered to contain 15 one-hundredths of a gallon of fuel. The fuel economy of a dual fuel passenger automobile shall be determined by harmonically averaging (and equally weighting) the fuel economy when operated on fuel and when operated on a methanol or ethanol mixture.

"(C) If a manufacturer manufactures natural gas powered automobiles or dual fuel passenger automobiles when operated on natural gas specified in section 501(21)(A), the fuel economy shall be based on the fuel content of the natural gas. For purposes of this section, 100 cubic feet of the natural gas used to operate such automobiles shall be considered to contain 0.823 gallons equivalent of natural gas. A gallon equivalent of natural gas shall be considered to contain 15 one-hundredths of a gallon of fuel.".

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AUTOMOBILE LABELING

SEC. 5. Section 506(a)(1)(A) of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2006(a)(1)(A)) is amended—

(1) by striking "and" in clause (ii); and

(2) by inserting immediately after clause (iii) the following:

"(iv) in the case of a methanol, ethanol, or natural gas powered passenger automobiles the fuel economy of such automobile when operated on the methanol or ethanol mixture, or natural gas, as the case may be, calculated under section 503(d)(4), multiplied by 15 percent, and

"(v) in the case of a dual fuel passenger automobile, the fuel economy of such automobile calculated under section 503(d)(4), multiplied by 15 percent, as well as the fuel economy of such automobile when operated on gasoline.".

REPORT

SEC. 6. Section 512 of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2012) is amended by adding at the end thereof the following:

"(d)(1) Beginning in January 1993 and annually thereafter, the Secretary, after consultation with the Secretary of Energy, shall submit to the Congress a report which contains the information specified in paragraph (2) of this subsection,

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together with such other information and recommendations as the Secretary considers necessary or appropriate to carry out the purposes of the Methanol and Ethanol Promotion Act of 1987.

"(2) As part of such report, the Secretary shall—

"(A) include information regarding the effects, if any, of the amendments made by such Act on the consumption of methanol, ethanol, natural gas and gasoline on an industrywide and manufacturer-specific basis;

"(B) in consultation with the EPA Administrator, include information regarding the effects, if any, of the amendments made by such Act on the achievement of fuel economy standards specified in section 502 on an industrywide and manufacturer-specific basis; and

"(C) in consultation with the EPA Administrator, recommend changes in the definition of 'dual fuel passenger automobile' in section 501(21) as technological developments warrant, in order to promote the actual use of methanol and ethanol, and to further the purposes of the Methanol and Ethanol Promotion Act of 1987.".

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CONFORMING AMENDMENT TO THE INTERNAL REVENUE CODE OF 1986

SEC. 7. Section 4064(b) of the Internal Revenue Code of 1986 (26 U.S.C. 4064(b)) is amended by adding at the end thereof the following new subparagraph:

"(8) EXCEPTION FOR ALTERNATIVE FUELS.—The determination of the tax to be imposed with respect to a methanol, ethanol, or natural gas powered passenger automobile or dual fuel automobile shall be based on the fuel economy rating established under section 503(d)(4) of the Motor Vehicle Information and Cost Savings Act.".

CONFORMING AMENDMENT TO THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT

SEC. 8. (a) The Congress finds that, in order to promote fully the development of methanol, ethanol, and natural gas powered passenger automobiles, the technology feasibility requriements of section 502(e) of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2002(e)) should reflect the experimental nature of such development.

"(b) Section 502(e) of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2002(e)) is amended by adding at the end the following: "For purposes of this subsection, the Secretary shall not consider the fuel economy of ethanol, methanol, or natural gas powered passenger auto-

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1 mobiles, and the Secretary shall consider dual fuel passenger
2 automobiles to be operated exclusively on gasoline.".

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Senator ROCKEFELLER. We have Richard Wilson here. We also have a panel from the Big Three auto makers on the way, and we also have a panel of experts on this whole matter. I think we will proceed now to Richard Wilson, who is Director of the Office of Mobile Sources, Office of Air and Radiation from the Environmental Protection Agency.

We are very glad that you are here, sir, and look forward to your statement.

I note that the auto panel is here, also.

And I would say once again that if Senator Wilson comes in, we will suspend proceedings so that he can say whatever it is that he wants to say.

Mr. Wilson.

STATEMENT OF RICHARD D. WILSON, DIRECTOR, OFFICE OF MOBILE SOURCES, OFFICE OF AIR AND RADIATION, ENVIRONMENTAL PROTECTION AGENCY

Mr. WILSON. Good morning, Mr. Chairman and members of the subcommittee. I am Richard Wilson, Director of EPA's Office of Mobile Sources, and I am pleased to be here today to testify about the subject of alternative transportation fuels.

The potential for alternative motor vehicle fuels to improve urban air quality has recently generated both considerable interest and some confusion. The increased interest is due largely to the fact that the Clean Air Act deadlines for attainment are rapidly approaching, and Federal and state agencies are examining every opportunity for additional control strategies. The confusion results from the fact that while all alternative fuels offer some type of emission reductions in certain circumstances, the actual reductions are dependent upon several factors: the particular pollutant, the specific fuel specification, the type of engine technology that will be utilized, and whether one uses a gasoline or diesel vehicle as a baseline.

I will try briefly to clear up some of this confusion by defining our current air quality problems, identifying what we see as the primary alternative fuel candidates, and projecting some of the likely emission reductions available from the use of these fuels.

I should note that EPA is a very active member of the Alternative Fuels Working Group established last spring by the President's Task Force on Regulatory Relief to assess the role of alternative fuels in meeting our national air quality goals. We released two reports in July under the auspices of the Task Force that have received very wide distribution. The first summarized the emission and air quality impacts of various alternative fuels and serves as the foundation for my testimony

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today. The second outlined a draft methodology by which state air quality planning agencies may take credit in state implementation plans for the lower emissions of vehicles utilizing alternative fuels.

On the subject of air quality problems, ozone is a primary concern in the class of substances known as photochemical oxidants that represent what we call smog. Ozone is not emitted directly but is a product of a series of complex atmospheric processes involving hydrocarbons, nitrogen oxides, and sunlight. EPA believes that for the most part urban area hydrocarbon control is generally the most promising strategy for reducing ozone levels. Motor vehicles are responsible for 30 to 50 percent of urban hydrocarbon emissions, and thus for approximately 30 to 50 percent of our urban ozone problem.

Based on data through 1986, there are 62 ozone nonattainment areas. As new, cleaner vehicles continue to displace older, more polluting vehicles, and as EPA and the states implement other controls, we expect many of these areas to move into compliance. Still, 20 to 30 of our largest cities will require major hydrocarbon emission reductions, on the order of 40 percent or more, to reach attainment, and such reductions will be difficult to achieve. Because of the large contribution of motor vehicle emissions to the ozone nonattainment problem, the use of alternative fuels may be one of the few remaining ways for some urban areas to come closer to attainment.

Motor vehicles are also responsible for 80 to 90 percent of carbon monoxide emissions in urban areas. There are currently 65 areas of nonattainment for carbon monoxide, but the future situation is much more promising than for ozone. Because new gasoline vehicles emit less carbon monoxide than old ones, our projections show that all but about 5 to 15 areas will move into attainment by the late 1990s simply with improvements brought about by existing motor vehicle standards.

The third pollutant of concern is particulate matter. While vehicles that use unleaded fuel emit very low levels of particulate, diesel trucks and buses are important sources of inhalable particulate, especially in central city areas.

Now, it is helpful to divide the various alternative fuels that are being considered into a couple of groups. One group includes those fuels that are primarily composed of gasoline and low levels of additives that can reduce vehicle emission. One significant advantage of such fuels is that because they are so similar to straight gasoline, current vehicles need no modification to operate on them. The corresponding drawback is that because the fuel is still primarily gasoline, it is not possible to take full advantage in terms of either emissions or efficiency of all of the potential benefits of the additive.

The second group of fuels includes alternative fuels that would be used as a replacement for gasoline. The optimum use of these fuels would be in new vehicles entering the fleet that are specifically designed to take maximum advantage of the combustion characteristics of these fuels. Methanol, ethanol, CNG and propane, when used as replacement fuels, all have the potential to significantly reduce the ozone contribution of motor vehicles. This is not so much because these

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fuels reduce the mass of volatile organic emissions compared to those of gasoline vehicles, but rather, the volatile organic emissions from these fuels have been shown to be less photochemically reactive, in other words, less likely to form ozone than those from gasoline vehicles.

EPA has studied the reactivity of methanol emissions in great detail recently, not only because it is a very clean fuel, but also because it appears to be one of the most likely future nationwide replacement fuels for gasoline. EPA has also worked with the State of California which has done pioneering work with methanol fuels.

Methanol is an excellent engine fuel that can be produced from natural gas, coal or biomass. It is currently priced at a level fairly close to gasoline on an energy basis. Current methanol vehicles utilize engines that are very simular to engines used in today's gasoline engines. These are also the types of engines that will be utilized in methanol flexible fuel vehicles.

We project that the emissions from current technology methanol vehicles certified to emission standards equivalent on a carbon basis to those applicable to gasoline engines, would create 20 to 50 percent less ozone than today's gasoline vehicles.

Although there is still much to learn, we think it is clear that engines optimized to take advantage of methanol's high octane, high flame speed and wide flammability limits, could be much cleaner and more efficient than current methanol engines. We project that future advanced technology methanol vehicles could reduce the ozone potential of vehicles by 85 to 95 percent. Because of the lean combustion, we would also expect much lower carbon monoxide emissions.

To date, few vehicles have been designed in the United States to operate on pure ethanol, although Brazil's transportation system runs predominantly on ethanol. We believe that the use of pure ethanol as a motor vehicle fuel would offer the same type of emissions benefits as methanol. The primary issues associated with ethanol's use as a replacement fuel are supply and cost.

Most of the vehicles currently operating in the U.S. on CNG fuel were gasoline vehicles retrofitted with a conversion kit to allow the vehicle to operate on either CNG or gasoline. There are limited emissions data on dual-fuel CNG vehicles, especially with respect to conversions of recent computer-controlled gasoline vehicles. We intend to perform additional CNG testing in the near future. At this time we estimate that dual-fuel CNG vehicles could contribute 50 to 80 percent less to ozone when operated on CNG than gasoline vehicles.

If conversions are properly performed and maintained, there are typically large carbon monoxide emission reductions as well. Drawbacks associated with CNG conversions include generally higher oxides of nitrogen emissions and poor vehicle performance due to both less engine power and increased weight from pressurized CNG cylinders.

The use of any of these replacement fuels, methanol, ethanol and CNG, as pure fuels in large truck and bus engines would essentially eliminate the diesel particulate or smoke that is characteristic of diesel engines. In certain central city areas, buses and trucks contribute sig-

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nificantly to the high particulate levels. EPA has been very supportive of methanol bus programs, ongoing or planned in San Francisco, Jacksonville, Seattle, Los Angeles, and Denver, all sponsored by the Urban Mass Transportation Administration, and has played a key role in coordinating a unique methanol bus demonstration program in New York City involving General Motors, the Natural Resources Defense Council, the Center for Auto Safety, and Celanese.

It now appears that CNG buses will also be operating soon in New York City, which will permit a comparison between two clean fuels, methanol and CNG, and existing diesel engines. It currently appears that alternative fuel bus engines may be a very attractive option for complying with our stringent 1991 bus engine particular emission standards.

I would now like to briefly discuss the second group of alternative fuels that could reduce motor vehicle emissions, fuels that are primarily composed of gasoline with low levels of additives. There are four gasoline blends of primary interest known as gasohol, the duPont blend, Oxinol and MTBE.

These gasoline blends generally have combustion characteristics very similar to those of straight gasoline and can be used in existing vehicles. All of the additives, ethanol, methanol and MTBE, increase the octane of the gasoline blend, although they also decrease the overall energy content of the gasoline somewhat. These characteristics do not significantly affect emissions, however. The two properties of the gasoline additives that do affect emissions are that they all contain oxygen in their chemical structure, and with the exception of MTBE, they raise the vapor pressure or volatility of gasoline.

The primary emission benefit of these gasoline blends relates to the oxygen content in the additives. Thus the blends are often referred to as oxygenated blends. Carbon monoxide emissions are almost exclusively a function of the air/fuel ratio of the auto engine. When a vehicle is fuelled with an oxygenated blend, the effect is to increase the air/fuel ratio of, or lean out that engine and thus reduce carbon monoxide emissions. This effect can be quite pronounced on pre-1981 cars. Cars built since 1981 generally have oxygen sensors in the exhaust that can provide feedback to the engine so that the air/fuel ratio can be more tightly controlled.

The use of oxygenated blends will increase the air/fuel ratio and decrease carbon monoxide emissions from these vehicles when they are in the open loop operation.

As would be expected, the carbon monoxide emission reductions are greater from older vehicles than from newer vehicles, and are directly proportional to the level of oxygen in the fuel. Gasohol, duPont and Oxinol blends all have oxygen contents in the 3 1/2 to 4 percent range. Based on the types of vehicles in use today, our analysis indicates that the use of any of these fuels would reduce motor vehicle emissions of carbon monoxide by approximately 22 percent.

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The maximum MTBE content of 11 percent yields and oxygen content of 2 percent, which in turn would reduce carbon monoxide by about 12 percent. It should be noted that these reductions will decrease in the future as newer feedback vehicles continue to displace older, nonfeedback vehicles.

The one potential emissions concern with some oxygenated blends is that the addition of ethanol or methanol to gasoline increases the volatility of gasoline. This in turn can increase the amount of evaporative hydrocarbon emissions. We believe that the use of oxygenated blends could significantly increase the ozone producing potential of motor vehicles unless this base gasoline is modified such that the oxygenated blend has the same overall volatility as straight gasoline.

Because carbon monoxide levels are highest in the winter, and ozone is primarily a problem only in the summer, this potential concern could also be mitigated by discontinuing any oxygenated blends program during the summer months.

EPA's Office of Mobile Sources and our Regional Offices have been working closely with the State of Colorado in its implementation of a mandatory oxygenated blends program for the Denver area and with government agencies and a legislative committee in Arizona in their consideration of such a program for parts of Arizona.

We believe such a program will be most successful if all the affected parties agree to support a program of this sort, and we have been working to help facilitate such a consensus.

Thank you very much for the opportuniuty to testify here this morning. I would be happy to answer any questions.

Senator ROCKEFELLER. Thank you, Mr. Wilson.

As I indicated earlier, Senator Wilson, who is crucial to this entire bill, and whose state is crucial to this whole effort, in fact changed his travel schedule o California in order to appear at this hearing.

And so, Senator Wilson, we want very much to hear whatever it is that you might want to say as well as any questions that you might want to ask.

OPENING STATEMENT BY SENATOR WILSON

Senator WILSON. Thank you very much, Mr. Chairman.

First let me again congratulate and thank you upon the leadership that you have shown in introducing what I think is some of the most important legislation for my state and presumably for the entire country that has been introduced in a long time. It is very helpful legislation, and I am delighted that the committee has been able to find time in a busy schedule to hear it. It is my sincere hope that once these hearings are completed we will be in a position to proceed to markup as soon as possible.

I count myself a strong supporter of almost all alternative fuels, but I am particularly interested in the potential that methanol represents in helping to clean up our environment. In California in particular, the prospect of methanol fuelled cars is one that gives me great optimism because they will be the single most effective option I think that we have to cleaning up our dirty air.

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Creating clean air options in California is vitally important; 35 of California's 58 counties are violating the Clean Air Act standards for ozone. Eight of these counties presently face the prospect of a construction ban for failure to clean up their air.

Unless we are willing to commit ourselves to solving the problem, ozone conditions will continue to threaten literally the physical health of our citizens, and it will impose severe constraints upon the economic health of our state by constraining artificially economic development that is needed and which would otherwise occur. In a state like California that is growing at a rate of three-quarters of a million people a year, this challenge will hardly grow any easier.

With a conversion to methanol as an alternative fuel to gasoline, the inherent emission properties hold the promise of creating significantly less ozone than is associated with tailpipe emissions from a gasoline powered car. Indeed, as I listened to Mr. Wilson this morning, I was impressed that the promise seems even greater than I had hoped that it would be.

One striking example of the advantages associated with methanol is provided by the South Coast Air Quality Management District. The district estimates that if all the cars and trucks that now ply the highways and roads of greater Los Angeles each day—that is about 2.3 million each day—if all those were suddenly taken off the roads, ozone formation would be reduced by approximately 22 percent. Conversion to methanol, on the other hand, they estimate, would reduce ozone formation by almost the same amount, by 18 percent, a difference of only four percentage points.

Now, once we recognize that we are compelled to take drastic action to achieve cleaner air—and I do not think that we need to spend much time in dispute about that—then alternatives such as methanol become increasingly attractive and deserve the most serious consideration that we can give them, and as this legislation, S. 1518, seeks to do, it is imperative that we try to make real the potential that is offered in this much cleaner burning fuel.

First there has to be an adequate supply of methanol, and right now the methanol industry is primarily targeted towards serving the chemical industry. New supplies will be needed to service an emerging transportation sector demand. In this regard, my office has been in contact with an individual who will soon be going to construction on a major new methanol-producing facility off the coast of Canada. I understand that this facility will dwarf all other similar facilities, and it is being designed specifically with the intent of serving an expected methanol auto fuel demand. This facility is expected to come on line by 1991.

Second, there has to be a distribution network established to bring methanol to the consumer, and there is good news to report on this front as well. The California State Energy Commission is undertaking a project in connection with Arco and Chevron, to make methanol available at 50 gas stations throughout California by the end of next year. This is only the beginning. I heard a spokesman for Arco say that from

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50 they would increase the number ultimately to 2000 in the Southern California area as demand required that they do so.

So more and more methanol pumps are being promised in following years. In the meanwhile, the flexible fuel vehicle which has the capacity to use either methanol or gasoline or any combination thereof, will tide us over until methanol is as widely available as gasoline is today.

And third, there has to be a demand for methanol in the marketplace. We have to persuade consumers that it is a highly desirable fuel, and it is this issue that the legislation e are hearing today is intended to address. By using the CAFE requirements to give incentives to the automobile manufacturers to produce methanol burning cars, we will achieve the objective of making these cars available to the consumer without having to resort to congressional mandates. I am convinced that once these cars are available to the consumer—and we have optimistic indications from major manufacturers in that regard—that consumers will want to buy them for a number of reasons that seem obvious, not the least of these being the knowledge that methanol cars will do something dramatically improving the air of, in my case California, but for virtually any air basin that has been as heavily impacted as so many have in recent years.

All three elements are required for a methanol conversion: production, distribution and demand. These are finally coming together. If the project that has been achieved to date continues, it is not at all overly optimistic to look forward to an entirely new era in alternative fuels in the very near future. We have been told that one of the major manufacturers could convert one of its existing models on a production line of about 100,000 to a vehicle that would be marketed at about $200 to $300 more than the current model by 1991.

I think this legislation, Mr. Chairman, that you have introduced, with wide cosponsorship, and I am proud to be among the cosponsors, S. 1518, gives the promise of the kind of incentives to the auto makers that can make real what I think is the most significant hope for improving the quality of air that I have seen in a long time of lots of conversation about it.

But I am eager to hear from our witnesses today, and again, grateful to you for convening this hearing, and even more, for the leadership that you have shown in this field.

Senator ROCKEFELLER. Senator Wilson, thank you very much.

As I indicated in my statement, Senator Danforth really started this off in 1985 and took a somewhat similar bill through the Commerce Committee, and he is here this morning, and I would welcome any comments that he might have.

Senator DANFORTH. Mr. Chairman, thank you very much.

I do not have an opening statement, but I appreciate your holding the hearing. I think this is an idea whose time has come, and let's move the ball forward.

Senator ROCKEFELLER. Very good.

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Senator McCain, do you have any questions of Mr. Wilson?

Senator McCAIN. Go ahead, Mr. Chairman.

Senator ROCKEFELLER. Mr. Wilson, obviously your testimony covers it in a lot of detail, but I take it that EPA's assessment is that automobiles using methanol will make a very substantial dent in air pollution, and particularly ozone problems, is that not correct?

Mr. WILSON. That is correct, Senator. Actually, it is one of the most promising further reductions that we can foresee. As you know, the country has gone through a series of racheting down emission levels on both automobiles and factories over the last several years, and finding more reductions is getting more and more difficult, and the alternative fuels provides us with one of the biggest further reductions we have been able to identify.

Senator ROCKEFELLER. On the other hand, it is also true that, you know, we may be talking 20 to 30 to 40 to 50 percent, or less, or more, but it is not all going to happen at once. It is going to take time.

Mr. WILSON. Of course.

Senator ROCKEFELLER. And does that not therefore argue for getting started in that everything in this area is incremental, and the technologies change and develop, and getting started on this whole process of alternative fuels for burning in automobiles is crucial?

Mr. WILSON. Yes, of course.

Senator ROCKEFELLER. The kind of contribution that methanol vehicles might make is obviously a subject of this hearing. Now, there are other control technologies that affect ozone nonattainment in general.

Mr. WILSON. Sure.

Senator ROCKEFELLER. You have indicated some of those.

Could you again repeat some of those, and could you compare them in their significance to the amount of benefit that comes from automobiles and alternative fuel use?

Mr. WILSON. Well, yes, Senator, I would be happy to.

The important thing to realize is that the major cities with serious ozone problems need reductions in volatile organic emissions of something on the order of 50 to 75, 80 percent. So we have identified a number of areas. Just the turnover of vehicles, with new vehicles meeting our present, tighter standards, is going to get another 20 percent reduction or so over the next several years. Improvements in the vehicle inspection and maintenance programs to make sure people keep their cars tuned and do not tamper with them will bring further reductions.

Some other regulatory actions that we have under way on fuel volatility and vehicle refuelling can do that. Further controls on a number of stationary sources can get further reductions as well.

When we add that all up, though, those short term things we can identify, we see a further reduction in the 30, 35 percent range.

That will bring a lot of cities into attainment that are not very far off the mark now, but it is far short of the 50 to 75 percent reduction needed by many of the major urban areas.

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When you start looking for further reductions, tighter controls on cars buy you only another percent or two if you tighten the tailpipe standards because they are already so well controlled.

You have to start looking for changes in the way people use vehicles. If you are talking about that, I think Senator Wilson's comment about the south coast is appropriate. You can take all the cars off the road, and that makes a reduction of 25, 30 percent.

If you are looking at social changes like that where you drastically change people's ability to use their vehicles, we think that is a long process to ever achieve, and probably not likely to be successful.

That is why we think the alternative fuels like methanol that can get you that kind of reduction while allowing people to continue their existing use of vehicles, while it may not happen tomorrow, I think is much more likely to be a successful path than some of the other approaches available to us.

Senator ROCKEFELLER. And particularly as we get started on it.

I thought Senator Wilson's example was very interesting, too. I mean, you could literally take every one of those 2.3 million cars off Los Angeles highways and you would get rid of 22 percent of the problem; or, if they were using methanol, you get rid of 18 percent of the problem and you would take none of them off the road. I think that is reasonably good stuff.

Now, in terms of EPA's current projections, in how many cities and for how long will there be a chronic ozone pollution problem?

Mr. WILSON. Well, as I said, we now have 62 cities in nonattainment. This summer has been a bad one for ozone, so I suspect the total number will go up somewhat when this year's data are built into that calculation. However, a lot of those cities are just around the standard, and as I mentioned, we have control programs both in place and under consideration that will bring many of them into compliance. We think that something like 30 major cities are serious long term nonattainment problems.

Senator ROCKEFELLER. And what percentage of the United States population lives in those 30 cities, and about what percentage of automobiles are in those 30 cities?

Mr. WILSON. I do not have that percentage offhand, but they are the major urban areas of the country, so it would be a relatively large percentage.

Senator ROCKEFELLER. Could you get that information for us?

Mr. WILSON. Sure, I would be happy to.

[The following information was subsequently received for the record:]

The estimate of 30 areas is not exact and EPA is not certain precisely which 30 areas will have the most difficulty in reaching attainment. However, EPA estimates that the Metropolitan Statistical Areas in this category contain about 35% of the U.S. population of both persons and vehicles.

Senator ROCKEFELLER. I would be grateful.

Now, we have been looking at flexible fuel vehicles and dedicated methanol and ethanol vehicles both. As I understand it, there has been some very good early research done on lean burn vehicles, which I guess you referred to as optimized.

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Mr. WILSON. Yes.

Senator ROCKEFELLER. I assume those are one and the same.

Mr. WILSON. Yes.

Senator ROCKEFELLER. Does EPA have an assessment of what kind of contribution these vehicles could make in the long term solution of this problem? What types of research are you doing on that, and what can you tell us about that?

Mr. WILSON. These would be vehicles that are optimized for use with methanol, for example, and therefore would be limited to burning only methanol, so they have the disadvantage of not being able to run on gasoline. But the advantage they would bring because they are designed to operate well on methanol is that you would get much more ozone reduction, and as I mentioned in the testimony, 85 to 90 percent versus 20 to 50 percent with existing methanol technology.

We think you can also get very low carbon monoxide emissions with the lean burn approach as well, and we think those vehicles would tend to be more efficient in terms of the economics of using methanol. So there are a number of advantages that can be had when the technology for methanol vehicles is developed to the extent that we have been working on gasoline vehicle technology for a lot of years now.

Senator ROCKEFELLER. Henry Ford did not wait for the invention of fuel injection to start building the Model T, did he?

Mr. WILSON. I do not believe so.

Senator ROCKEFELLER. Senator McCain, do you have any questions?

Senator MCCAIN. Yes, Mr. Chairman, thank you.

Thank you, MR. Wilson.

I appreciated your testimony very much, and I think it was very thorough.

I would like to follow up a little bit on the line of questioning that the Chairman was following.

There are approximately, say, 60 cities that are in violation at this time, and you think there are about 30 of those that are on the edge, so to speak, that could come into compliance relatively easily.

Mr. WILSON. Yes.

Senator MCCAIN. But those 30 remaining cities, do you see any chance of them coming into compliance unless they have a program such as an alternative fuel program of some kind?

Mr. WILSON. Oh, certainly the worst of those, no. I think an alternative fuel program or some other program to greatly reduce vehicle emissions, and as I said, the only other alternatives we have been able to identify tend to keep people from driving cars so much, and the practicality of those solutions may be limited. So no.

Senator MCCAIN. One that, for example, that is bandied about is just larger mass transit systems, use of them, but in the west particularly those have not been really viable options. They would entail a pretty significant change in lifestyle.

Mr. WILSON. I agree.

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Senator McCAIN. Most of those 30 cities that we are talking about that in your opinion would not be able to come into compliance unless they had some significant alternative fuels program, are those concentrated in the west, the cities?

Mr. WILSON. No, they are not, but obviously California cities tend to have some of the worst ozone problems in the country.

Senator McCAIN. Arizona and Colorado?

Mr. WILSON. Yes, although—well, Colorado tends to be more of a CO problem, and the CO problem in Phoenix tends to be more of a problem than the ozone problem, but they have an ozone problem as well.

Senator McCAIN. You mentioned in your statement that you are working closely with the State of Colorado.

Mr. WILSON. Yes.

Senator McCAIN. And you are also working on the implementation of a mandatory oxygenated blends program in the Denver area, and also with government agencies and a legislative committee in Arizona, in their consideration of such a program for parts of Arizona.

Can you elaborate on that a bit because it appears to me that other states and cities are going to have to work with you to come up with those kinds of alternatives.

Is that accurate?

Mr. WILSON. Yes. The program I was talking about there is the use of these oxygenated blends which are 5 or 10 percent alcohol fuels blended with gasoline. They tend to provide not ozone benefits but CO benefits. For areas with serious CO problems—Denver has the worst in the country, I think Phoenix is about third or fourth in the country in terms of serious CO problems—those kinds of blends can provide 20 percent or so reduction in CO emissions on a relatively short order because those fuels can be used in existing vehicles.

So for those areas, we see CO as not quite as dire a situation as ozone. We think there are probably 5 to 15 cities that have long term CO problems. Phoenix is probably one of them, along with Denver and Los Angeles. For those cities it is probably good to be looking at a program, as Phoenix is now, and as the State of Arizona is for Phoenix, and the same kind of program Denver put in place and will be implementing this winter.

Senator McCAIN. I will admit to not having in-depth knowledge on this issue, so I guess we have to go on the premise that there is no such thing as a dumb question, but if we have got a country like Brazil who has basically converted their entire ground transportation, at least combustion engines, to a system of methanol or ethanol, I guess.

Mr. WILSON. Ethanol.

Senator McCAIN. What were they able to do that we are not able to do?

Mr. WILSON. Well, I think it is an economic, energy, and in that case, farm policy decision that was made in Brazil. They are not able to do anything we cannot do if we decide we want to do it. The Brazilians made a decision that in order to increase their energy independence

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and to provide, to shore up some of their farming industry, they were going to convert their vehicles to ethanol use, which they have largely done. So they have developed a large ethanol industry in Brazil.

It is certainly possible to do that in this country. Obviously we would have to look—there are many competing alternative fuels, and each of them has some advantages and disadvantages.

Senator McCAIN. Methanol being the most efficient or economically viable at this point?

Mr. WILSON. Well, methanol probably is more likely to be the fuel that would replace gasoline in mass use in this country, I think. There are more sources of supply. It could be produced from the coal supplies we have in this country, plus other. Natural gas is what it is produced from now, but I think there are probably uses of both ethanol and CNG, but I would guess methanol would be the largest volume fuel in the future.

Senator McCAIN. Let me just ask you one other area that is not exactly the subject of this hearing, but particularly in the west again, we have experimented with solar powered and electric powered vehicles.

How do you view the future of those methods of power over time?

Mr. WILSON. Well, there is still a fair amount of work being done on electric vehicles. The Department of Energy has the research program in that area. I guess our view is that liquid fuels are still likely to be the fuel for transportation in this country for the foreseeable future, and while there will be places for electric vehicles, again, I would think liquid fuels are going to be the vast majority of the fuel use in the country.

Senator McCAIN. Thank you.

Thank you, Mr. Chairman.

Senator ROCKEFELLER. Senator Danforth.

Senator DANFORTH. Thank you, Mr. Chairman.

Mr. Wilson, methanol is made from coal, correct? What else——

Mr. WILSON. You can make methanol from almost anything. But it is presently made from natural gas. It can be made from coal.

Senator DANFORTH. Tell me, what do you think, supposing this bill were to become law or something like it were to become law, what would be your thoughts about how much methanol would be made and what it would be made from?

I am not going to hold you to any number of how much, but I mean just in very general terms for general edification. Would there be a huge demand for methanol, and how would it be produced?

Mr. WILSON. It is a little difficult to project because I do not know to what extent the auto industry will view the CAFE benefits of this bill as a major incentive and how many vehicles they will --

Senator DANFORTH. Let's suppose that this is a big deal and that methanol is going to push forward.

What would happen? What would happen to the demand for oil in the country, and how would the methanol be made, and what if any would be the environmental down sides of producing the methanol?

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Mr. WILSON. Well, for the next several years, I think we would project that the methanol would be produced from natural gas. Almost all methanol is now produced from natural gas. There is a large supply of natural gas that has been flared at the remote sites around the world. There are a lot of the Persian Gulf countries building methanol capacity to make use of what is essentially a free good, the natural gas they have been flaring, so that the new methanol capacity that is coming on line is all natural gas-based, and I would expect that for the foreseeable future that would be the basis of the methanol used as a result of this bill, Clean Air Act pressures on states to develop programs and the like.

In the longer term, particularly with an assumption of oil prices rising, that is going to make alternative sources of methanol more appealing, such as coal. We think there is probably enough natural gas supplied methanol now for 2 million to 3 million vehicles, and you could probably get up to maybe 40 million vehicles with additional natural gas supply. But if demand got well beyond that, I think you would be into the coal-based methanol.

Senator DANFORTH. Is there anything else you can make it from?

Mr. WILSON. We can make it from any biomass, sure. Essentially it is a process where you first generate natural—you gassify these other products and then you produce methanol from that gas, much as it is now produced from natural gas.

Senator DANFORTH. A number of years ago, in the late 1970s, we were concerned about running out of natural gas.

Mr. WILSON. Yes.

Senator DANFORTH. And therefore, decontrolled natural gas.

Mr. WILSON. Right.

Senator DANFORTH. Now this is a major source of energy that will be obtained from natural gas.

Is there a problem there?

Mr. WILSON. Well, to some extent, but largely not. As I mentioned, most of the new methanol capacity is being built in places where the natural gas is largely remote, apart from uses. It is now largely being flared, and therefore putting a methanol plant there—shipping the natural gas requires it to be liquefied, which is fairly expensive, and so producing methanol on site and then shipping the methanol is a cost-effective way to make use of that energy.

Senator DANFORTH. Let's suppose that you were a hypothetical Senator from a high sulfur coal producing state.

Do you think that you could tell your constituents that this would be a promising use for high sulfur coal?

Mr. WILSON. Yes, sir, we think it is. We think it is probably the most environmentally attractive use of coal in the country.

Senator DANFORTH. And to produce methanol from coal, that does not have any negative environmental consequences?

Mr. WILSON. I cannot say that. I mean, obviously producing methanol from natural gas is a cleaner process than producing methanol from coal, but if we are going to make use of the coal resources of this

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country, producing methanol from it is probably the least impacting way of using that coal on the environment that we are aware of.

Senator DANFORTH. Do you view this, Mr. Wilson, as a big deal or as a little deal?

Mr. WILSON. Which?

Senator DANFORTH. The bill, the approach that we are going to take?

Mr. WILSON. From a purely environmental perspective, obviously we think alternative fuels are likely to play an important, critical role in helping cities achieve air quality standards, and so anything that can help develop that technology, help create incentives for its use that are not there today is obviously useful in terms of the environmental benefit.

Senator ROCKEFELLER. I think that is a big deal.

Senator DANFORTH. That did not sound like a rave review to me.

Mr. WILSON. Well, I am dancing only slightly. I am really not here to give an administration view one way or the other on the bill. That is still being developed. But obviously we——

Senator DANFORTH. They have only had three years to think about it. We would not want them to rush into anything.

What is your thought about it? Did you have a spring in your step when you headed for the Dirksen Building this morning, or was it hard to get out of bed?

Mr. WILSON. After I finally got my car downtown I had a spring in my step.

Yes, again, we really are bullish on alternative fuels and the environmental benefit they provide, and therefore bullish on anything that is going to help us get there sooner.

Senator DANFORTH. Thank you.

Senator ROCKEFELLER. Thank you very much, Mr. Wilson. I am grateful for your taking the time to come here.

Now, let's go to our first panel. This will be somewhat awkward, not the panel, that is, but the timing because at 10:30 we are going to have a vote. But we sometimes plan to vote and then do not. In any event, the vote will not take long.

So I would ask Mr. Samuel Leonard, who is Director of Automotive Emission Controls, Environmental Activities Staff for General Motors Technical Center, to come forward; Mr. Donald Buist, Director, Automobile Emissions and Fuel Economy Office, Ford Motor Company; and Mr. Howard Padgham, the Chief Engineer, Power Train Engineering Programs, Chrysler Corporation.

Gentlemen, we genuinely appreciate what I know almost from an hour to hour basis that you have been through in the last 18 hours or so. I followed you on the way to the Detroit airport, in the Detroit airport, and the various snack bars, and we are really grateful that you are here, and look forward to what you might have to say.

Perhaps you could start, Mr. Buist.

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STATEMENTS OF SAMUEL A. LEONARD, DIRECTOR, AUTOMOTIVE EMISSION CONTROLS, ENVIRONMENTAL ACTIVITIES STAFF, GENERAL MOTORS TECHNICAL CENTER; DONALD R. BUIST, DIRECTOR, AUTOMOBILE EMISSIONS AND FUEL ECONOMY OFFICE, FORD MOTOR COMPANY; AND HOWARD PADGHAM, CHIEF ENGINEER, POWER TRAIN ENGINEERING PROGRAMS, CHRYSLER CORPORATION

Mr. BUIST. Thank you, Senator.

My name is Don Buist. I am the Director of the Automotive Emissions and Fuel Economy Office of Ford Motor Company.

Ford Motor Company greatly appreciates the opportunity to appear before this subcommittee to provide comments on S. 1518. We commend Senator Rockefeller on his leadership in introducing this bill, which would promote the use of alternative fuels. I also would like to take the opportunity to acknowledge the efforts of Senator Danforth, who has been a long time advocate of alternative fuels, and Senators Wilson and McCain, who are cosponsors of S. 1518.

Ford supports S. 1518 as an important first step toward encouraging alternatives to petroleum-derived transportation fuels. As a manufacturer of cars and trucks, our success depends upon an assured long term supply of readily available and affordable fuel.

In recent years the U.S. has enjoyed a period of stable energy prices and has been able to reduce its dependence on the most politically insecure sources. However, the fact that the U.S. continues to use more of the world's oil supply than it produces, and that imports are expected to increase, remains a major concern.

We feel the time is right for the U.S. to explore alternatives to gasoline and diesel fuel. The transition to alternative fuels is likely to take many years, and today's relatively stable energy situation affords us all the opportunity to develop a well-reasoned strategy.

Moreover, the emergence of a promising new technology, the flexible fuel vehicle, offers the potential to resolve the dilemma that has stymied the introduction of alternative fuel vehicles. Because of abundant supplies and the relatively low cost of petroleum-based fuels, there has been little incentive for energy producers to market alternative fuels. Similarly, there has been no reason for vehicle manufacturers to consider producing cars and trucks capable of operating on alternative fuels without widespread availability of the fuels.

It should be recognized that a manufacturer considering the production of FFVs, or flexible fuel vehicles, faces inherent market and technology risks. Initially, customers are unlikely to be willing to purchase this technology unless these vehicles are essentially indistinguishable from gasoline powered vehicles in terms of durability, reliability and performance. Despite encouraging results from prototype vehicles in operation, FFVs are still in the development stage, and many technical issues remain unresolved.

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S. 1518 is a constructive approach to breaking the impasse that has hindered the development of alternative fuels for the transportation sector. It would provide incentives to vehicle manufacturers to produce vehicles capable of operating on alternative fuels. The bill also would clarify how alternative fuel vehicles would be treated for corporate average fuel economy purposes.

While the intent of S. 1518 clearly is to encourage the manufacture of alternative fuel vehicles, and we believe it will do so, Ford is concerned that the bill applies only to passenger cars. Trucks could play an important role in development of alternative fuels because many trucks operate out of fleet facilities that are conducive to dedicated fuel supplies. Also, trucks typically have larger fuel tank capacity, wehich can offset the lower BTU content of alcohol fuels.

Another provision of the bill stipulates that the amount of CAFE benefits that could be earned by producing alternative fuel vehicles would be decreased automatically in the event that unexpected market conditions require a downward admustment in the fuel economy standards. This provision would prevent a manufacturer from knowing in advance what level of CAFE benefits to expect when the vehicles are introduced.

Ford urges the committee to consider revisions to the bill that would include trucks, and Ford would welcome working with the committee to this end.

It should be emphasized that the incentives in S. 1518 alone cannot assure the development of a nationwide fleet of alternative fuel vehicles. The key to an effective alternative fuels program is a market environment in which alternative fuels and vehicles can be commercially viable. This requires a reasonable assurance of fuel supply, distribution and price.

Ford believes that a coordinated strategy among government policymakers and the auto and energy industries is essential to creating and sustaining such an environment.

In summary, Ford supports S. 1518 as a positive step toward the development of an alternative fuels program. We commend the committee's interest in long range alternatives to petroleum-based fuels and urge that this bill be adopted.

I would also like to mention that we brought with us today one of our flexible fuel vehicles, and it is parked at the C Street entrance to this building, and will be available for Members and staff of the committee to drive after the hearing.

Thank you.

Senator ROCKEFELLER. Thank you very much.

Is that the Crown Victoria?

Mr. BUIST. Yes, it is.

Senator ROCKEFELLER. Fine.

Mr. Leonard, we would like to hear from you, sir.

Mr. LEONARD. Thank you, Senator.

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My name is Samuel A. Leonard. I am Director of the Automotive Emission Control Department of the Environmental Activities Staff of General Motors Corporation.

We welcome this opportunity to share with you our views on alternative fuels, and particularly on methanol as an automotive fuel. Because of the time spent in the Detroit airport yesterday, I do not have a separate oral statement but will excerpt from my record statement if you will bear with me.

General Motors continues to believe that there is a real possibility that methanol will someday be the dominant fuel for the transportation sector in this country. The potential benefits are certainly intriguing. These include possible improvements in energy security, air quality and precious metal usage. There are still unresolved questions as to the extent of these potential improvements, and many engineering refinements are still necessary to commercialize the use of methanol.

The big problem is economic viability. Simply put, it costs less to run vehicles on gasoline and on diesel fuel than on methanol. Large scale commercialization of methanol will not occur until this cost gap closes. Some believe this gap will close in the near future, and so it is important to prepare for that eventuality.

A major remaining problem with any alternative fuel, including methanol, is the expense and the long lead time involved in the large scale production and the nationwide distribution systems for methanol. Before energy companies will make the necessary huge investments to supply methanol, they must have a market for such fuels. On the other side, the auto companies are hesitant to invest in methanol-fuelled vehicles absent an established fuel supply.

We believe the Federal Government can play an important role in resolving this dilemma. By providing CAFE credits for methanol-fuelled vehicles, and especially for variable fuel vehicles, the Federal Government can provide an incentive to the auto manufacturers to lead the way out of the chicken and the egg dilemma.

At General Motors our vision for methanol is broad, and accordingly, or programs are varied. We are investigating low concentration blends of methanol and gasoline which we believe can help the nation immediately in terms of petroleum replacement.

However, since many of the vehicles in use today were not designed to use alcohol-containing fuels, we must determine the effects of long term use on our customers' vehicles. We are developing vehicles to use neat or near-neat methanol, variable fuels, that is, zero to 100 percent methanol or gasoline, or any of their mixture, and vehicles which blend methanol and gasoline on board the vehicle.

We recognize the potential importance of the variable fuel vehicle in the transition from petroleum-based fuels to methanol. We are devoting considerable effort to make the VFV as good as our production vehicles and thus provide a transition vehicle that would satisfy the customer expectations. Such technology strides are a prerequisite to making the transition to methanol.

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Recognizing the importance of variable fuel vehicles in the transition to a methanol-based transportation system, we are concerned that the CAFE incentives for the variable fuel vehicles are less than those for a dedicated fuel vehicle. It should be recognized that the fewer restrictions placed on the generation of CAFE credits, the greater the incentive for vehicle manufacturers. Thus, the fuel economy calculation for VFVs could be based on their methanol capabilities; that is, the calculation would provide the same fuel economy value as a dedicated methanol vehicle, not an average of the gasoline and methanol values.

GM's pioneering effort to use methanol in a "diesel" engine is a milestone towards commercializing methanol. GM buses fuelled by methanol are operating in California and in Florida, and we will be providing six methanol buses to New York City within a month or so. In a couple of years we will have nearly 80 methanol buses operating in the U.S. and Canada.

Our target is to offer a commercial methanol power plant for buses in 1991 that will meet the stringent particulate emission standard.

GM has a variety of vehicle development programs involving methanol-containing fuels. Most notably, GM's advanced engineering staff is testing mid-sized cars which run on neat or near-neat methanol. Recently we have added our unique VFVs to this test fleet.

For all of these modern fuel-injected, front-wheel drive vehicles, emissions, driveability and fuel economy are being evaluated, as well as cold starting, lubrication, engine wear and materials compatibility. We believe we have made significant advancements in the engine controls necessary for a VFV with driveability acceptable to the consumer.

Our research and development studies with low concentration blends, neat methanol, near-neat methanol, variable fuel vehicles and even dual-fuel vehicles have convinced us that although in the near term blends have significant potential, and although VFVs may be critical to making transition to methanol, ultimately neat methanol is the most desirable approach to maximize engine efficiency and minimize pollution.

Meaningful incentives can play a role in commercializing alternative fuels. We would respectfully suggest that the proposed legislation could go further in three areas. One, it could provide greater CAFE credits for alternative fuel vehicles. Two, it could provide as great an incentive for VFVs as for dedicated vehicles. And three, it could provide incentives for low concentration oxygenated blends. The use of such blends provides benefits with regard to pollution in the development of the alcohol fuel infrastructure. In addition, the use of such blends also clearly provides benefits with regards to energy security.

Because of the latter, we continue to believe that they should be included in the proposed legislation to help offset the risk to manufacturers, since much of the current fleet was not designed for alcohol-containing fuels.

These immediate measures will be helpful in preparing the nation for the transition to nonpetroleum fuel sources for the transportation sector.

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In summary, we believe that methanol has significant potential to reduce our reliance on petroleum. We are pleased with the legislative initiative that recognizes this potential and recognizes the role CAFE credits can lay in encouraging the auto companies to break out of the chicken and the egg dilemma.

Thank you.

[The statement follows:]

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STATEMENT OF GENERAL MOTORS CORPORATION

Good morning. My name is Samuel A. Leonard, Director of the Automotive Emission Control Department of the Environmental Activities Staff of General Motors Corporation. We welcome this opportunity to share with you our views on alternative fuels, and particularly on methanol as an automotive fuel.

There is a recognized need for transportation fuels that can be derived from resources other than crude oil. Environmental and other concerns may also provide impetus to move toward alternative fuels. The question is not whether we need alternative fuels, but rather when, which ones, and how will we use them? What is the best strategy for leading to their timely use? Fortunately, we have many options, and the breathing room to make intelligent choices.

Many alternative fuels can be derived from resources other than crude oil. They include hydrocarbons from coal and oil shale, methanol from coal or natural gas, ethanol from biomass, compressed natural gas (CNG), and liquefied petroleum gases (LPG). Alcohols can be used in neat or near neat form and also as low concentration blends with gasoline.

Each of these alternatives has unique characteristics regarding cost, environmental impact, energy security, vehicle technolbgy required, safety and health-related effects and, customer acceptance. Based on these considerations, methanol has emerged as a clear leader in the alternative fuels race, but some others such as CNG and oxygenate blends with gasoline may also play a role in specific situations. For example, CNG may be an appropriate fuel in selected high mileage, limited range fleet applications in urban areas where air quality is a concern, such as Los Angeles and New York.

Similarly, low concentration blends of oxygenates with gasoline can, in addition to reducing our reliance on petroleum, reduce carbon monoxide emissions from certain vehicles, and thus can serve a purpose for cities with carbon monoxide attainment problems, such as Denver and Phoenix. Although too expensive for neat applications, ethanol and methyl tertiary butyl ether (MTBE) which is derived from methanol, can be useful as oxygenated blends.

We cannot ignore any of these other alternative fuels. However, for large scale use as a national transportation fuel, we must turn our focus toward methanol. Even with methanol, there are a variety of possibilities. Current attention is focused on M85 because it offers advantages in safety and "cold start," but at a cost of environmental and energy security benefits. One hundred percent methanol, M100, would offer greater environmental benefits, but it has more difficulty with cold start and safety, i.e., flame visibility.

General Motors continues to believe that there is a real possibility that methanol will someday be the dominant fuel for the transportation sector in this country. The potential benefits are certainly intriguing; they include possible improvements in energy security, air quality, and precious metal usage.

There are still unresolved questions as to the extent of these potential improvements, and many engineering refinements are necessary to commercialize the use of methanol. The big remaining problem is economic viability. Simply put, it costs less to run vehicles on gasoline and diesel fuel than on methanol. Large scale commercialization of methanol will not occur until this cost gap closes. Some believe this gap will close in the near future and so it is important to prepare for that eventuality.

A major remaining problem with any alternative fuel, including methanol is the expense and long lead time involved in the large-scale production and nationwide distribution systems for methanol. Before energy companies will make the necessary, huge investments to supply methanol, they must have a market for such fuels.

On the other side, the auto companies are hesitant to invest in methanol-fueled vehicles absent an established fuel supply. We believe the Federal Government can play an important role in resolving this dilemma. By providing CAFE credits for methanol fueled vehicles, and especially for variable fueled vehicles, the Federal Government can provide an incentive to the auto manufactures to lead the way out of the chicken/egg situation.

On the vehicle side there are still many engineering refinements necessary to commercialize the use of methanol. As I shall explain, GM has made significant progress in solving the utilization side of the chicken/egg dilemma.

At General Motors, our vision for methanol is broad and, accordingly, our programs are varied. We are investigating low concentration blends of methanol and gasoline, which we believe can help the nation immediately in terms of petroleum replacement. However, since many of the vehicles in use today were not designed to use alcohol-containing fuels, we must determine the effects of long term use on our

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customer's vehicles. We are developing vehicles to use neat and near neat methanol, variable fuels, i.e., 0 to 100 percent methanol or gasoline or any of their mixture, and vehicles which blend methanol and gasoline onboard. We recognize the potential importance of the variable fueled vehicle (VFV) in the transition from petroleum-based fuels to methanol. We are devoting considerable effort to make the VFV as good as our production vehicles, and thus provide a transition vehicle that would satisfy the customer expectations. Such technology strides are a pre-requisite to making the transition to methanol.

Recognizing the importance of variable fueled vehicles in the transition to a methanol-based transportation system, we are concerned that the CAFE incentives for the variable-fueled vehicles are less than those for a dedicated fuel vehicle. It should be recognized that the fewer restrictions placed on the generation of CAFE credits, the greater the incentive for vehicle manufacturers. Thus, the fuel economy calculation for VFV could be based on their methanol capability, i.e., the calculation would provide the same value as a dedicated-methanol vehicle—not an average of the gasoline and methanol values.

General Motors is studying the use of methanol in a variety of powerplants as well. These include two- and four-stroke spark ignition and compression ignition engines, stratified charge engines and even gas turbines. In fact, our methanol programs include futuristic technologies such as fuel cells which offer even greater potential for high efficiency and low emissions. Methanol is truly unique in being adaptable to such a wide variety of technology options.

GM's pioneering effort to use methanol in a diesel engine is a milestone toward commercializing methanol. GM buses fueled by methanol are operating in California and Florida. We will be providing six methanol buses to New York City within a month or so. In a couple of years, we will have nearly 80 methanol buses operating in the U.S. and Canada. Our target is to offer a commercial methanol powerplant for buses in 1991 that will meet the particulate emissions standard.

General Motors light-duty vehicle programs with neat and near neat methanol and VFV continue to focus on solving tough engineering problems such as cold start, driving range, material compatibility and control of formaldehyde emissions. Our scientists are working on developing catalysts for methanol-fueled vehicles which are able to control formaldehyde emissions.

We have a variety of vehicle development programs involving methanol-containing fuels. Most notably, GM's Advanced Engineering Staff is testing mid-size cars which run on neat or near neat methanol. Recently we have added our unique VFVs to this test fleet. For all of these modern, fuel-injected, front-wheel-drive vehicles, emissions, driveability and fuel economy are being evaluated, as well as cold starting, lubrication, engine wear and material compatibility. We believe we have significant advancements in the engine controls necessary for a VFV with driveability acceptable to the consumer.

General Motors is also participating in a demonstration program with the Department of Energy and Argonne National Laboratories and has delivered five S-10 trucks which operate on 85 percent fuel, and five gasoline-fueled trucks for purposes of comparison and analysis. We envision similar participation with our VFVs as well.

Our research and development studies with low-concentration blends, neat methanol, near neat methanol, variable-fueled vehicles and even dual-fueled vehicles have convinced us that, although in the near term, blends have significant potential, and VFVs may be critical to making transition to methanol, ultimately neat methanol is the most desirable approach to maximize engine efficiency and minimize pollution.

Meaningful incentives can play a role in commercializing alternative fuels. We would respectfully suggest that the proposed legislation could go further in three areas. One, it could provide greater CAFE credits for alternative fueled vehicles, two, it could provide as great an incentive for VFVs as for dedicated vehicles, and three, it could provide incentives for low concentration oxygenate blends. The use of such blends provides benefits with regard to pollution and the development of the alcohol fuel infrastructure. In addition, the use of such blends also clearly provides benefits with regard to energy security. Because of the latter, we continue to believe that they should be included in the proposed legislation to help offset the risks to manufacturers since much of the current fleet was not designed for alcohol-containing fuels. These immediate measures will be helpful in preparing the nation for the transition to non-petroleum fuel sources for the transportation sector.

In summary, we believe that methanol has significant potential to reduce our reliance on petroleum. We are pleased with the legislative initiative that recognizes this potential and recognizes the role CAFE credits can play in encouraging the auto companies to break out of the chicken/egg dilemma.

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Senator ROCKEFELLER. Thank you, Mr. Leonard.

Mr. Padgham, we welcome your comments from Chrysler.

Mr. PADGHAM. Thank you, Mr. Chairman, for inviting Chrysler Motors to testify at this hearing on S. 1518.

Methanol, in our opinion, offers the best prospect for becoming a viable alternative transportation fuel for passenger cars and trucks, and S. 1518 is a good first step in promoting a methanol economy.

There are three key areas of the bill which we will comment on: first, the incentives to promote methanol.

Chrysler supports the development of alternative fuels produced in the U.S. to reduce our nation's dependence on foreign oil. Since most alternative fuels are not currently cost competitive with gasoline and diesel fuel, government support will initially be necessary in order to launch and sustain a new fuel until it is economically self-supporting. For this reason we believe the bill should go further to provide more substantial incentives to promote methanol.

For instance, it should include a provision requiring the Federal Government to acquire methanol powered or dual-fuel vehicles for its own vehicle fleet. We will be interested in working with the U.S. Government in investigating such a program.

CAFE credits can provide an incentive to manufacturers to produce and sell alternative fuel vehicles. However, we believe CAFE credits should be structured to encourage a full range of methanol vehicle technologies. In particular, CAFE credit incentives should be available to manufacturers of dedicated methanol vehicles as well as dual-fuel vehicles. We believe CAFE credit incentives should also apply to light duty methanol-powered trucks. The proposed bill only provides such incentives for the sale of passenger cars.

Incentives are necessary to promote methanol vehicles because vehicle manufacturers must expend considerable resources to design and develop methanol or dual-fuel vehicles. For this investment to be profitable, there must be the promise of a sufficient market for such vehicles.

However, granting incentives to the vehicle manufacturers will not be enough to stimulate the purchase of a methanol or dual-fuel vehicle. Fuel must also be made readily available, and at a competitive price before consumers will find the economics of methanol appealing.

The second area of the bill we would like to comment on deals with our technology concerns. Chrysler's alternative fuel vehicle development program is modest at this time. Most of the progress we have made has been on dedicated methanol vehicles. We are presently developing a gasoline-tolerant methanol vehicle which is designed to operate primarily on methanol but can also operate on gasoline. This concept allows us to take advantage of the unique fuel properties of methanol.

However, the definition for a dual-fuel passenger automobile in the proposed bill requires that the vehicle be capable of making instantaneous adjustments to the fuel/air ratio for the entire range of mixtures. The only known technology to accomplish this kind of performance is based on the use of a unique sensor whose proprietary nature renders it unavailable to Chrysler at this time

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The second concern is lead time. Development of vehicles and fuel systems that meet the full range of performance, fuel economy, driveability and other customer needs will require substantial lead time. In the automobile industry, five years is considered an acceptable lead time to develop a commercially acceptable vehicle, especially with unproven technology. Given our current programs, 1995 is probably the earliest model year that we could begin production of dedicated methanol-powered vehicles.

Another major technical concern is with the proposed language in the bill requiring that the driving range of a dual-fuel vehicle be at least 250 miles, based upon the combined EPA city-highway fuel economy. Since the energy content of methanol is about half that of gasoline, it is clear that the fuel tank of a methanol vehicle must be nearly twice as large if the driving range is not to be reduced.

Although it is technically feasible to redesign the fuel tank to extend the range to 250 miles for methanol, a significant tear-up to the underbody and rear structure of the vehicles would be required. Such structural modifications could be avoided only if the methanol range requirements were restricted solely to all new vehicles. The product life cycle of a body is typically seven years, and we would therefore be essentially barred from the methanol market without further relief.

We believe that a lower range limit of 200 miles in S. 1518 would allow many more manufacturers to compete in the methanol vehicle market.

The third area of the bill we would comment on is the labeling of new vehicles. Chrysler believes that the fuel economy label on new vehicles is beneficial to consumers contemplating the purchase of a vehicle. However, we are concerned that the calculation of label fuel economy proposed in the bill may mislead consumers because it bears no relationship to the fuel economy that they could expect under typical driving conditions, and we would therefore suggest revisions.

In summary, Chrysler believes methanol can become a viable alternative energy source, and S. 1518, amended as suggested, would provide the initial impetus for vehicle development. However, government incentives such as fleet purchases, coupled with the availability of competitively priced methanol, are necessary to the successful introduction of this technology.

Chrysler recognizes a number of technological concerns which should be addressed by the proposed bill, including availability of the sensor technology, vehicle driving range, the reasonable lead time for development and implementation.

Finally, we believe the fuel economy label on each vehicle sold should reflect the measured fuel economy.

Thank you, Mr. Chairman. This concludes a summary of our comments which are submitted in full for the record.

[The statement follows:]

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STATEMENT OF HOWARD B. PADGHAM, CHIEF ENGINEER OF ENGINE ENGINEERING, CHRYSLER MOTORS

Thank you, Mr. Chairman for inviting Chrysler Motors to testify at this hearing on Senator Rockefeller's bill, the "Methanol and Alternative Fuels Promotion Act of 1987," S. 1518. We support this Subcommittee's interest in the need for, and development of alternative fuels for transportation purposes. Methanol, in our opinion, offers the best prospect for becoming a viable alternative transportation fuel for passenger cars and trucks, and S. 1518 is a good first step in promoting a methanol economy. There are several key areas of the bill which we will comment on directly: (1) incentives to promote methanol, (2) technological concerns, and (3) labeling of new vehicles.

Incentives to Promote Methanol

Chrysler supports the development of alternative fuels produced in the U.S. to reduce our nation's dependence on foreign oil. Since most alternative fuels are not currently cost competitive with gasoline and diesel fuel, government support will initially be necessary in order to launch and sustain a new fuel until it is economically self-supporting. For this reason, we believe the bill should go further to provide more substantial incentives to promote methanol. For instance, it should include a provision requiring the Federal government to acquire methanol-powered or dual-fuel vehicles for its own vehicle fleet. We would be interested in working with the U.S. government in investigating such a program. In particular, we urge the federal government to purchase a minimum of 5000 methanol-powered or dual-fuel vehicles per year for use in government fleets. Chrysler is supportive of this type of program as an important step in resolving the "chicken and egg dilemma" of vehicle availability versus fuel availability.

CAFE credits can provide an important incentive to manufacturers to produce and sell alternative-fueled vehicles. However, we believe CAFE credits should be structured to encourage a full range of methanol vehicle technologies. In particular, CAFE credit incentives should be available to manufacturers of dedicated methanol vehicles as well as dual-fuel vehicles. We believe CAFE credit incentives should also apply to light-duty methanol-powered trucks. The proposed bill only provides such incentives for the sale of dual-fuel passenger cars. By expanding this incentive to all segments of the market, there will be more opportunities for consumer use and acceptance of a range of alternative-fueled vehicles, including trucks.

Incentives are necessary to promote methanol vehicles because vehicle manufacturers must expend considerable resources to design and develop methanol or dual-fuel vehicles. For this investment to be profitable, there must be the promise of a sufficient market for such vehicles, approximately 100,000 vehicles per year for Chrysler. Presently, however, methanol is more expensive than gasoline on an energy equivalent basis and we do not foresee a change in this situation in the near future. Therefore, it is clear that granting incentives to manufacturers is not enough to stimulate the purchase of a methanol or dual-fuel vehicle. Fuel must also be made readily available at a competitive price before consumers will find the economics of methanol appealing.

Concerning section 4(b) of S. 1518, we believe the proposed limits on the available CAFE credit for dual-fuel vehicles should be simplified. Rather than impose two limits of 1.2 and 1.5 miles-per-gallon for the initial five year period, we suggest a single limit of 1.2 mpg with no restriction on the number of dual-fuel or methanol-powered passenger automobiles or trucks. The same simplification would appear to be reasonable for the second five year period, for which we suggest a single limit of 0.9 mpg.

Technoloqical Concerns

Chrysler's alternative fuel vehicle development program is modest at this time. Most of the progress we have made has been on dedicated methanol vehicles. We are presently developing a gasoline tolerant methanol vehicle (GTMV) which is designed to operate primarily on methanol, but can also operate on gasoline. This concept allows us to take advantage of the unique fuel properties of methanol. However, the definition for a dual-fuel passenger automobile in the proposed bill requires that the

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vehicle be capable of making "instantaneous adjustments to the air-fuel ratio for the entire range of mixtures...". The only known technology to accomplish this kind of performance is based on the use of a unique sensor whose proprietary nature renders it unavailable to Chrysler at this time.

In addition, we feel the definition of a dual-fuel passenger automobile as "is capable of operating on methanol or ethanol" is not sufficiently restrictive to prevent the inclusion of vehicles that may not drive well when us ing methanol, the fuel the bill is intended to promote.

The language in the proposed H.R. 3399, "runs as well on methanol as on gasoline" captures the spirit of what we believe should be part of the definition. More precise, however, than the term "runs" would be the engineering term "driveability", which is now coming more into use by laymen. Driveability describes a set of vehicle operating characteristics, namely, a measure of starting, idling, and driving quality. To address both of our concerns, we propose the following definition for a dual-fuel passenger automobile: "capable of being operated on methanol or gasoline with driveability characteristics as good as or better when operating on methanol or ethanol than when operating on gasoline."

With regard to the definition of a methanol fuel, we recommend that the term "methanol mixture" be defined as "the mixture of methanol with gasoline" rather than "with other fuel" because gasoline is expected to be used. This is more consistent with the fuel definition for "dual-fuel passenger automobile" in S. 1518. Also, this more precise definition will assist vehicle manufacturers in designing the vehicle, since vehicle design parameters such as optimum fuel economy, emissions, driveability and performance are all dependent on the precise composition of fuel on which the vehicle operates.

Development of vehicles and fuel systems that meet the full range of performance, fuel economy, driveability and other customer needs will require substantial leadtime. In the automobile industry, five years is considered an acceptable leadtime to develop a commercially acceptable vehicle, especially with unproven technology. Chrysler appreciates that the CAFE credit provisions of the bill considers leadtime and suggests that any other initiatives or time-related provisions of the bill also take leadtime constraints into account. 1995 is probably the earliest model year we could begin production of dedicated methanol-powered vehicles.

Another major concern is with the proposed language in the bill requiring that the driving range of a dual-fuel vehicle be at least 250 miles based upon the combined EPA city/highway fuel economy. Since the energy content of methanol is about half that of gasoline, it is clear that the fuel tank of a methanol vehicle must be twice as large if the driving range is not to be reduced.

Although it is technically feasible to redesign the fuel tank to extend the range to 250 miles for methanol, a significant tear-up to the underbody and rear structure of our vehicles would be required. This results from the fact that the fuel tank is attached to the rear underside of the floor pan and capacity can only be gained by raising the floor pan. This would necessitate changes to the underbody structure which in turn would require recertification for impact standards, etc. Such structural modifications represent a major capital investment which could be avoided only if the methanol range requirements were restricted solely to all new vehicles. The product cycle life of a body is typically 7 years and we would therefore be essentially barred from the methanol market without further relief.

We believe that a lower range limit of 200 miles in S. 1518 would allow many more manufacturers to compete in the methanol vehicle market and would eliminate the uncertainty of seeking Administrative relief from the Secretary of Transportation as presently drafted in the bill. Competition in the marketplace will be sufficient incentive to increase the range as new models are developed.

Labeling of New Vehicles

Chrysler believes that the fuel economy label on new vehicles is beneficial to consumers contemplating the purchase of a vehicle. However, we are concerned that the calculation of label fuel economy proposed in the bill may mislead consumers t
it bears no relation to the fuel economy they could expect under typical driving co
tions. Instead we recommend that for methanol- powered vehicles, the label show

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miles per gallon on methanol calculated the same as that of gasoline vehicles and also the gasoline equivalent miles per gallon. Likewise, for dual-fuel vehicles the label should show the methanol fuel economy as we suggest for methanol vehicles and also the fuel economy when the vehicle is operated on gasoline.

Conclusion

In summary, Chrysler believes methanol can become a viable alternative energy source, and S. 1518 as amended in accordance with the above suggestions would provide the initial impetus for vehicle development. Government incentives such as fleet purchases coupled with the availability of competitively priced methanol, are necessary to the successful introduction of this technology. Furthermore, CAFE incentives should be simplified and applied to methanol and dual-fuel vehicles alike. Chrysler recognizes a number of technological concerns which should be addressed by the proposed bill including: availability of the sensor technology, vehicle driving range, and reasonable leadtime for development and implementation. Finally, we believe the fuel economy label on each vehicle sold should be the measured fuel economy.

Chrysler remains interested and willing to assist the Subcommittee in its efforts to promote an alternative fuel bill.

Senator ROCKEFELLER. Thank you, Mr. Padgham.

I thank all of you.

Incidentally, on the dedicated vehicles, that credit is given. In fact, there is a greater credit given in S. 1518 for purely dedicated vehicles.

Mr. PADGHAM. Yes, we understand that.

Senator ROCKEFELLER. Maybe we should go under the five minute rule for questioning and then come back if necessary.

I want to ask a couple of fairly basic questions to the panel. Any of you can answer.

A number of people or critics have pointed out that electric vehicles had similar CAFE incentives offered in, I guess it was, 1980. Now, they might say, or rather, I might say why do you think that CAFE credits for methanol, ethanol or natural gas vehicles will end up any differently?

Why do you think that circumstances are right to pursue this approach in the next five to ten years when the electric car example is thrown at us?

Mr. PADGHAM. If I might take that on, Senator, I think in our testimony we basically allude to the fact that we do not think that by itself, as construed, the bill would actually lead to us producing methanol cars. We are very concerned about the fact that there is not a fuel supply there at a competitive price, and I think you will find that just natural economic forces will dictate whether methanol cars become a success in the marketplace or not, and we feel more incentives are needed to assure that happening.

Senator ROCKEFELLER. Gentlemen?

Mr. BUIST. Senator, I think CAFE credits, at least from my company's perspective, is an extremely valuable incentive. CAFE is a very, very serious regulation that permeates our total business here in North America.

Senator ROCKEFELLER. Can the folks in the back of the room hear? It is good to keep the microphone close.

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Thank you, go ahead.

Mr. BUIST. If you go back, I think it is almost unfair to compare the 1980s and electric vehicles to the 1987-1988 time frame with methanol vehicles. There is almost no comparison when we talk about jumping from gasoline to electric versus gasoline to methanol. I mean, there is a huge technology jump to electric. There is not that kind of jump to methanol because, first of all, it is a liquid fuel, the infrastructure is there to handle another liquid. The technology differential to electric from gasoline is tremendous.

So I do not think there is a fair comparison.

With respect to CAFE incentives and how they relate to methanol promotion, I think it is a natural relationship. First of all, CAFE incentives are a cost-free incentive. It does not cost the government money to put the incentive in place. CAFE, its purpose was conservation of energy, which is again one of the major purposes of bringing methanol on board.

So I think it is a natural incentive, and again, at least from Ford Motor Company's perspective, it is a very significant incentive.

Senator ROCKEFELLER. Mr. Leonard?

Mr. LEONARD. I would just add one thing to Mr. Buist's statement and point out that regardless of the incentives and regardless of legislative——

Senator ROCKEFELLER. Mr. Leonard, could you speak right into the microphone?

Thank you.

Mr. LEONARD. I said regardless of the incentives or the magnitude of the incentives or regardless of the legislative mandate, you cannot mandate invention, and I think to make an acceptable commercial battery or electric powered vehicle, you are basically trying to mandate invention, and the invention did not come about to make a commercially viable electric vehicle.

I do not think the technology of going to a methanol-powered vehicle is nearly the step function that going to a battery electric vehicle was.

Senator ROCKEFELLER. And in any event, the incentives are in place in this bill, and therefore, you would have some view that the possibility of refuelling, the refuelling marketplace will become activated? It would be different in that the incentives are in place, you can count on them if the bill passes. They will be there.

That would then change your view of the so-called refuelling marketplace and its potential?

Mr. LEONARD. It would certainly help. It is a step in the right direction.

Again, it is going to depend on whether we can make the vehicles commercial and with the incentives there, and especially with the CAFE pressure that our companies are under, it is a sizeable incentive.

Senator ROCKEFELLER. All right.

Now, each of you in your statements in various ways and in conversation with me, in the case of one of you, and with my staff in the case of all of you over the past 18 months, have cautioned not to or to carefully limit the incentives.

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You have expressed some concern about the caps and some of the provisions which square this legislation very much with the fuel economy goals of the CAFE law.

Realistically, however, to exceed the caps of Senate Bill 1518, GM would have to produce 440,000 vehicles that are of this definition; Ford would have to do in excess of 200,000; and Chrysler in excess of 120,000 vehicles. If you also pursue trucks—and I might say that I am for the inclusion of light duty trucks in the bill—that would be additional vehicles.

Now, these numbers represent 10 percent of your respective fleets, the numbers that I have given each of your companies. Given the risks involved in producing alternative fuel vehicles, is it realistic to think that before the turn of the century you would put so many eggs in one basket?

Mr. BUIST. I am not sure of your final question, Senator.

Senator ROCKEFELLER. Well, let me tell you the point of my question. Are each of you for your various companies, going to be producing that many vehicles? I have a feeling that you are going to be in fact much more cautious, you are going to be producing fewer vehicles, and that you are not going to be over that 10 percent.

I want you to discuss that.

Mr. BUIST. I would agree with that, Senator. I think to sit here and say we would exceed that 10 percent would be unrealistic, and in fact, I would agree with you that we in the auto sector as well as the petroleum sector should. If we do not proceed cautiously—and an example of proceeding cautiously in my mind is this bill—we could get in trouble. We cannot make the mistake of putting a product out there that the customer does not want, or that he or she perceives as a poor quality product, something that does not run properly in relationship to gasoline, and he or she conclude they will never buy one again for that very reason. We cannot make that mistake.

If we collectively make that mistake, methanol is dead.

Mr. PADGHAM. I would concur with Mr. Buist. It just comes down to, in my mind, the simple economic rationale that the customer makes at the end of the line.

Senator ROCKEFELLER. Mr. Leonard.

Mr. LEONARD. I would concur as far as going with caution in the early stages, but, for example, if we can develop a very feasible, very good variable fuel vehicle for the customer that has the methanol capability, I could easily see us going over that type of range in the late 1990s, once we have a proven technology.

Senator ROCKEFELLER. All right.

Another question that I need to ask each of you. Some have suggested that the CAFE credits granted to the car companies should be strictly limited to the amount of methanol actually used by those vehicles.

Our legislation tries to draw a reasonable line on this, a mid point line. What problems would you envision with a requirement to link the CAFE credit to actual methanol usage?

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Mr. BUIST. I think the problem you create if you try—first of all, it is going to be difficult to determine what actual usage is, but let's assume somebody can do that. If you attempt to link it to actual usage, I think you defeat the purpose of the incentive. The incentive is supposed to truly be an incentive for us to produce methanol vehicles, and CAFE I say again is a very important incentive.

I think the bill takes a reasonable midline approach. In other words, it does not give too much, it does not give too little. It takes a midline approach which says basically, let's assume that it is used roughly half the time. I think that is a reasonable way to go to crack this chicken and egg and create some reasonable incentives.

Mr. PADGHAM. If I could add a few more words, somewhat similar to Mr. Buist here, I think you would be actually increasing our risk if you decided to determine CAFE credits based on actual use. There is already a risk with CAFE standards as they are because you produce the vehicles in the hope of selling them, and then when they are sold, the actual sales numbers determine what the CAFE is. If you have layered on top of that the actual use of the methanol fuel which goes into the CAFE computation, you will be in a very, very difficult position of predicting what you really need to make to meet the standards.

So my recommendation would be to keep the credits as simple as you can.

Senator ROCKEFELLER. Mr. Leonard?

Mr. LEONARD. As we have learned in the last few years, there is no incentive when your CAFE ends up being determined by something over which you have absolutely no control, and in this case it would be the methanol usage. In the past it has been the price of gasoline. And we have learned very well, that is not a situation we want to be in.

Senator ROCKEFELLER. All right, then, let me just pin that down with a final follow-up question.

If CAFE credits are the catalyst for your investing in commercial development of this technology, would you make such an investment five years ahead if those credits were in doubt?

Mr. PADGHAM. No, I do not think we would. We would be more sensitive to that opportunity.

Mr. BUIST. In other words, you are indicating if suddenly the incentive were to disappear, would we still embark --

Senator ROCKEFELLER. Would you make the investment on your own?

Mr. BUIST. That is one incentive that would be gone, and I would have to say the chances of making the investment would be less.

Senator ROCKEFELLER. Mr. Leonard.

Mr. LEONARD. I would ask you if you would work next week for a 20 percent chance of getting paid.

Senator ROCKEFELLER. That answers the question.

Senator Pressler has come in. He is also a cosponsor of this bill.

We welcome you, Senator Pressler, and wonder if you would have any statement or questions.

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Senator PRESSLER. Mr. Chairman, I thank you very much for holding this hearing and moving this legislation forward. We have talked and talked and talked about getting methanol and ethanol off the ground, but it never seems to happen, for one reason or another, and I finally think we have two bills now that will really make a difference. One is the Clean Air Act and the surrounding legislation that will come forth from that in one form or another, even if you are for it or against it, it is going to happen in the nonattainment cities. And this piece of legislation, which is a very practical piece of legislation which is actually implementing a step towards giving some assistance to those in the auto industry who take the leadership.

Let me say that one of the major concerns expressed during the Environment and Public Works Committee hearing's consideration of the clean air legislation was the lack of available alternative fuel vehicles. If alternative fuel vehicles are not available, it is impossible to comply with these provisions.

Today we are discussing a related issue; the current CAFE standards provide disincentives for auto manufacturers to develop alternative fuel vehicles. They are actually disincentives. And this is part of the reason why very little is happening in this area, is because if the vehicles are not available, obviously the public cannot use the fuel that will provide less pollution and use some of our grain surpluses and also provide a more efficient fuel in the long run.

This is a case where a number of committees must work together to develop a coordinated policy to encourage the development of alternative fuels such as ethanol and methanol.

Now, I would certainly support giving auto makers credit for developing alternative fuel vehicles. Developments of vehicles will provide environmental benefits, reduce our dependence on foreign oil and benefit taxpayers through lower farm program costs.

So, Mr. Chairman, I am very happy to be a cosponsor of this bill, and I know this question has been asked in other forms, but I will ask it again to see if any of the panel have additional comments, and that is it has occurred to me that we have had talk and talk and talk about getting on the road and getting into operation methanol and ethanol vehicles to lessen that pollution in the great cities and elsewhere, but it is really not happening.

Why is that, and will this bill make it happen?

Mr. LEONARD. I would like to start with that one.

Number one, in some respects it is happening. We have on the diesel bus side, with primarily particulate emissions, we have a program to have a commercial methanol-powered bus engine by 1991. It is a stand-up program right now, and it is well on its way.

With respect to the second—with respect to light duty vehicles, will this make it happen? I cannot guarantee that it will make it happen. It will provide incentives for us to work harder towards that goal, but as I stated earlier in my testimony, I cannot guarantee the breakthroughs necessary to make a commercial vehicle out of this. But the incentives make it more likely to happen than it would be absent the incentives.

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Mr. BUIST. I think my colleague said it well. We at Ford are well into the preliminary research stages of looking at flexible fuel vehicles as well as dedicated, and we have had in excess of 650 vehicles in various demonstration programs, primarily because we see a movement in this country in that direction, and we want to be ready for it when it becomes serious.

Now, we conclude it is not serious yet, but the pot is certainly being stirred, and this bill certainly promotes that end. It creates a huge incentive for us to do something and really gets us thinking seriously.

Now, do we have plans for production today? No, we do not. We are still currently going through the research stages, very early research stage on flexible fuel vehicles. We have a long way to go in the development process. But we think we as a manufacturer are kind of on line and kind of at the spot we ought to be at this point in time, and we are watching. We are watching for an infrastructure for methanol to start, and we kind of see the very beginnings of that in California. And we are starting to see the beginnings here in Washington of bills that would promote that type of fuel.

Mr. PADGHAM. I would echo my two colleagues. I still restate again, the ultimate customer has to see some economic benefit in buying a methanol vehicle which will have, say, a $200 or $300 cost penalty over a gasoline vehicle, in volume, that is, and he will have to see the fuel at the pump at a competitive price, which would be an incentive then to lay out that extra cash.

So this bill is a step in the right direction, and it sort of helps the manufacturer with an incentive, but I do not think it handles the whole situation.

Senator PRESSLER. Well, as I see it, and this is my final question, but as I see it, there are two pieces of legislation that really do something about this ethanol/methanol thing. One is the Clean Air Act; the other is this bill. There are many other bills and resolutions floating around.

But if the Clean Air Act passes, and it will pass in some form to do something about the so-called nonattainment areas, the cities, the big cities and the areas where pollution creates the acid rain plus the pollution for its citizens, something has got to happen, and we cannot keep the vehicles off the road, and it is going to be—somehow we are going to get to methanol and ethanol at some point in the 1990s or maybe past the year 2000.

In addition to this piece of legislation, what other legislation could we pass that would speed that time up? Or can we depend on the free market to do it?

Mr. LEONARD. I would like to answer just a little bit different question if I might, there, because of your reference to the Senate Clean Air Act bill. I am very, very concerned with some of the provisions in that bill that would essentially mandate the use of alternative fuel vehicles on a set time frame, to the extent that we have learned historically, if the vehicle is not ready for the market, you are going to poison the well for that vehicle forever. So I am very concerned about the provisions that would require so many vehicles out there or such percentage of the

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fleet by such and such a date because we do not know in our development programs at this stage if those vehicles are going to be ready and acceptable for the customers in that time frame.

The second thing that bothers me in the Senate bill is there is a requirement in there that the formaldehyde emissions from the alternative fuel vehicles be exactly the same as they are in gasoline, and that kind of provision in the Senate bill could kill immediately any methanol fuel program because that is one of the most difficult things to control and one of the things that we have not learned how to do yet.

Senator PRESSLER. Now, say that again. I cannot quite hear.

What was that second point?

Mr. LEONARD. There is a requirement in the Senate bill that the formaldehyde emissions from methanol fuelled vehicles be no more than they are from gasoline fuelled vehicles. The control of formaldehyde for methanol vehicles is one of the most difficult things that we are looking at right now from an emissions standpoint, and a requirement spelled out in the Senate Clean Air Act bill that stringent, not giving us time to work our way down to that over iterations of technology could spell the end of methanol fuelled vehicles before they ever get started.

I understand why it is there, they do not want the extra ozone from it, but that stringent a requirement right up front may bar the methanol vehicle from ever getting started.

Senator PRESSLER. But if there are not some requirements, do you think it will ever happen?

The problem is, we have been talking and talking about this whole business. I remember in 1974 participating with a group of Congressmen and industry leaders, and we had a car that was there. This was 1974. This was 13 or 14 years ago, which is a long time in my realm of things, and really not very much has happened. In fact, we may have gone backwards. We went forward a little bit.

But if we do not have some time requirements or some kind of a plan, will it happen? If we just did nothing, would it happen?

Mr. LEONARD. What I think you have seen since that time frame is the development of a new technology called flexible fuel vehicles by Ford Motor Company, variable fuel vehicles by General Motors company, which in conjunction with the CAFE incentives offered by this bill provide a way to begin to break out of the chicken and egg dilemma which I think has held up the development over the last ten years.

Senator PRESSLER. Does anybody else want to offer some comments? Is there anything in addition to this legislation that we should be working on, or are we undoing the applecart? Of course, the Clean Air Act, that is in another committee. I do not want to get into a debate about that, but I see a synergistic relationship between these two, what is moving through, and the Clean Air Act probably will not pass in its present form, but I can assure you that for the nonattainment areas something is going to pass. We are going to have to deal with it somehow.

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And nothing is happening without some legislation. I would rather not see any legislation.

But maybe there is a better way to go at it, or maybe we should be doing something more.

Does anybody want to add on to that?

Mr. BUIST. I guess I would support what Mr. Leonard said and just expand a little bit to indicate that we also are very concerned with the emission standards that would eventually be established for methanol or ethanol or alcohol vehicles; formaldehyde again being also our major concern.

We think this bill is on line with what we described—and there is an attachment to my statement where there is an eight step process that we look at as a reasonable sequence of events that should take place to get methanol, for instance, on line in this country. We think, we are at about step three. We think with respect to Ford Motor Company, and the Federal Government, we collectively are at about step three. We have got some development fleets in the field, and now we are looking at what we call government/agency incentives, and we see this bill as a significant incentive. We think now is the time to create incentives and let the oil industry and the auto industry pick up on the incentives and start the ball rolling.

We are afraid that if you go down the mandate road, as I indicated before, you are going to force problems on the consumer, and the consumer, if he even perceives that he does not want a methanol vehicle, for whatever set of reasons, I think we have hurt the process; we have added another X number of years to the process to turn him around.

I do not want to get in a position of having to turn him around and convince him it is a good vehicle. I would like him to be convinced when he drives the first one.

Senator PRESSLER. Very well, Mr. Chairman. I commend you on this bill and would say that this is something that is going to happen in our society, I hope sooner rather than later. When we mark this bill up perhaps there will be amendments to improve it, but I think it is an excellent piece of legislation, and it is synergistic with some of the other efforts that are happening around the Capitol.

Senator ROCKEFELLER. Thank you, Senator Pressler.

Senator McCain.

Senator MCCAIN. Thank you, Mr. Chairman.

I do not have much to ask. I would like to make a comment to our witnesses, and I will try to be careful when I do so.

I must say I am not overwhelmed by your enthusiasm, nor am I overwhelmed by your commitment. Yes, we have to build a product that is acceptable to the consumer, that he will not only buy but come back for another one, and I certainly understand that, and I do not think any one of us here are not supporters of the free market. But there are also active steps that you can take to sell this product to the consumer, just like the steps that you take nowadays selling other features of the products that you sell to the consumer.

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It is not gratifying to me, nor certainly the people of the state that I represent who are facing serious problems in coming into compliance with the EPA standards, to hear that it would be sometime past the turn of the century before we could expect any significant contribution as far as numbers or percentage of FFVs or VFVs, whichever name a company wishes to call it.

I just think that to consign to the Federal Government the primary responsibility for providing the incentives and doing the work for you is not appropriate. It is not only inappropriate, but I think you are going to find that the Japanese are probably going to be doing a lot more than you are. And again, we may find a situation where the Japanese co-opt this market and make breakthroughs in technology that you will either have to copy or somehow play a game of catch-up as we have in other areas of automotive improvements that have been made by the Japanese before you have.

So I guess the only question that I have for you—and I would be more than happy to hear your responses to that statement—suppose this bill were passed tomorrow, suppose that we mandated that the Federal Government acquire X thousand—I do not know know exactly what the number was—alternative fuel vehicles right away, as soon as possible for their fleet of automobiles and even light duty trucks.

At what year would you expect that we could at least have 10 percent of the market being vehicles that are equipped with FFVs?

I guess we could start with you, Mr. Leonard, or whoever chooses to start.

Mr. LEONARD. If the Federal Government wanted to buy the vehicles, I am sure we would consider quoting on them. As to what year that would get us to 10 percent of the fleet, that is pure speculation at this time. But it would be whenever we could get the vehicle to the state of commercial salability to the consumer and the consumer saw something in the vehicle that would make him buy it because the Federal Government is not going to buy 10 percent of my vehicles.

I would point out that we have done considerable work in developing these vehicles to this stage without the incentives. I do not think the Japanese are ahead of us on this one. I think we are well ahead of them. And I think we are being more than responsible in working on this product and working hard to solve the remaining technical problems and economic problems that exist.

But the big problem over and above those is the economic problems with the cost of methanol and whether the customer is ever going to find it cheaper to run on methanol fuel or acceptable to run on methanol fuel as opposed to gasoline. And that is something over which the auto companies have no control whatsoever.

Senator MCCAIN. What is the price of a gallon of methanol today?

Mr. LEONARD. The price of a gallon Mr. McCain today, is about 45, 46 cents. The projections are that if it gets into some kind of demand, you are going to be up into the 70 cent range. It has got about half of the energy content of gasoline. You are talking a wholesale price of gasoline today somewhere around the 70 cent range. So even today it is

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not cost competitive, and with greater demand on it, it may or may not be.

But that is something that I cannot control as an auto manufacturer.

Senator McCain. Well, is it not true usually with greater demand the price comes down on most products?

Mr. Leonard. Not when the product that is out there today is out there because there is a glut on the market. There is more supply out there today than there is demand, and that depresses prices.

Senator McCain. The previous witness from the EPA stated that he thought there was practically an unlimited supply, or let me rephrase that, a very substantial supply of natural gas, and then we have virtually unlimited supplies of coal.

Would you not suspect that over time, since the basic raw material is there, that the price would come down?

Mr. Leonard. As the price goes up, the supply will go up. As you get it from natural gas flared in the Middle East, for example, that is going to be the cheapest way. As you get it from natural gas in the U.S., that is expensive. As you get it from coal, that is quite a bit more expensive yet.

So in order to tap those sources, the price is going to have to go up.

Senator McCain. Thank you.

I just say your statement defies the history of any product that I have ever heard of of which there is an ample natural resource for because not only over time as there is demand for these products are the resources utilized, but the methods used in utilizing those resources improve also. But I certainly do not think it is time for us to have a debate over that.

Mr. Leonard. And I would not argue with you. It may very well come down, but everything we can see now says it is going to go up. But right now there is a price differential, and the customer does not have the incentive to buy a methanol vehicle.

Mr. Buist. Senator, you obviously are frustrated, and there are a lot of people that are frustrated with respect to methanol, and we as an industry get criticized because we cannot and are not putting a methanol vehicle out there next year.

Let me give you some idea of what happened in Brazil. Maybe this will help in understanding the process we are forced to live with. Brazil is essentially on an ethanol supply base right now. The government of Brazil, in 1975 concluded they had to become energy independent and therefore switched to ethanol. It was available.

In the following year, 1976, they put together a joint government-industry agreement, that the two reached an agreement to go forward with ethanol. Experimental fleets started in 1977 and 1978, and production first started in 1980, five years after the agreement was reached. In addition, in that five year period they concluded that it was not enough to just switch to ethanol, they had to put some incentives in place.

They put in place things like fuel price supports, the same things you were just talking about here. They lowered vehicle taxes to give incentives to consumers to purchase ethanol. And then in 1975, when they

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first concluded that they were going in that direction, they put a 20 percent blend mix in place, a ethanol/gasoline blend to start the process to get the consumer used to the fact that he is going to burn ethanol and to eliminate some apprehension.

So I think that is a prime example of a country that decided to go in the direction of ethanol, and it took them about five years to really get the thing rolling and get it on board and get the consumers going, but more importantly, get manufacturers into production. That is really what we are saying here today. That process, almost just like it, has to take place here.

Senator McCAIN. If I thought we could do it in five years, I would be overjoyed.

Mr. BUIST. Well, keep in mind that all I am indicating is there has to be a point in time at which the five year period starts. In other words, there has to be a point at which the manufacturers and the oil industry both conclude, we are going, we have to go for whatever set of reasons, and once that decision is made, then the five year clock starts.

Senator McCAIN. Thank you.

Mr. BUIST. And I think this bill is a prime example of an incentive that could eventually start that clock.

Mr. PADGHAM. The only thing I would like to add, Senator, is that it comes back to the situation of economics again, again right back to the customer. As you displace gasoline by having fuel available in methanol form, that means there is going to be a glut of oil, and therefore the price of oil will go down, and you are still going to have this cost differential.

I think in the long term methanol is going to be the fuel of choice for a whole variety of reasons, but we do not see that happening in the near future without some form of incentives on the fuel itself to persuade the customer that it is a good thing to buy.

I think a parallel to that is what has happened in Canada. In the Province of Ontario we manufacture vehicles which operate on LPG, and the reason customers buy them is because they had incentives from the Ontario government and from the federal government. Those incentives have been withdrawn, and the sales of those vehicles has just dropped dramatically to the point where we are seriously considering getting out of that business.

I think the same type of thing needs to be viewed in methanol. There has to be a demand for the product as an incentive for us to produce it, apart from the good incentives that are in this bill.

Senator McCAIN. Well, I very much appreciate that, but I hope we are not forgetting that there are all kinds of incentives that we can give the American people, and one of them is an appeal to not only improvement in their lifestyles but that of future generations, and I would suggest that people who live in places like Los Angeles, Phoenix, Arizona and Denver, Colorado where we see these incredible problems with clean air, would make, if properly educated, would make considerable sacrifice, and certainly give an opportunity to these kinds of vehicles and engines if we educated them as to the benefits that would be provided to them, not simply those that are financial.

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I certainly have that strong impression from the people that I represent. So I think it is well to recognize this is not totally on a dollars and cents basis, at least in my opinion, and the Federal Government as well as you could do a lot in the area of, just as we have educated the American people not to litter, we have educated a whole generation of Americans, I think, that smoking is dangerous to their health. I think we could educate them as to how important this is to preserving a decent lifestyle in their places in which they live, these 60 cities which, although the EPA representative could not give the precise figures to the Chairman, it is clear that that probably represents some 80 percent of the American people, those 60 cities that are now in violation of air standards.

So I hope we would not fail to consider that there is a strong feeling out there in America that we need to do something about this air that is polluting not only our lives but that of future generations.

I have no more questions.

Senator ROCKEFELLER. Thank you, Senator McCain.

I think it is important to remember that we are talking about relatively young technology, and that if we do not break the chicken and the egg cycle, nothing is really going to get going.

I mean, with respect to coal, when I was driving the Ford flexible fuel vehicle, that happened to be West Virginia coal, but it was made down at an Eastman-Kodak plant in Tennessee. I do not know whether anybody else is making that, but there is no development on the technology yet because there is no demand for it, and I think all of this is conditioned upon what happens, can we break the chicken and egg cycle, can we get started, can we get going, and when we can, then I think there are real possibilities.

It is going to take time and all of that, but we have got to get started on it, and I think that is the point that some of you gentlemen have been trying to make. If there were not the incentives that there are in S. 1518, I suppose you would all agree that regardless of whether we should or should not, or whether people are educated to the problem or not, you would not proceed on this flexible fuel vehicle technology on a commercial basis without the incentives.

Am I right or wrong in that, that you would not simply do it out of the——

Mr. PADGHAM. That is one of the considerations, correct.

Senator ROCKEFELLER. What does that mean?

Mr. PADGHAM. Well, we would be more inclined to pursue this type of technology with this incentive than without it.

Senator ROCKEFELLER. On a broad scale.

Mr. PADGHAM. But that does not mean overall that we will necessarily do it.

Senator ROCKEFELLER. Would you gentlemen agree with that?

Mr. BUIST. I would agree with you, Senator, something has to be done in the way of incentives to crack it, either on the auto side or the oil side. It is not moving, something has to crack it open and start it moving, and this bill I think is one first step, one good first step.

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Senator ROCKEFELLER. Mr. Leonard?

Mr. LEONARD. I agree that it needs the incentive, and this is a good first step.

Senator ROCKEFELLER. Again, you have been through a rather extraordinary day which those in the audience do not know, but we do. There would have been people here to fill in ably for you, but we are very glad that you are here, and I think you a lot.

Our final panel is Mr. Warren Noteware, Commissioner for the California Energy Commission; Eric Vaughn, who is the President and Chief Executive Officer of Renewable Fuels Association; Mike Baly, who is Vice President for Government Relations, the American Gas Association; and Clarence Ditlow, the Executive Director, Center for Auto Safety.

Perhaps, Commissioner Noteware, we might start with you. In that it is a somewhat larger panel, and in that time is moving along, if you would hold yourselves to five minutes, I would be grateful, summarizing testimony or whatever.

Commissioner, we are very proud of what you are doing and very glad that you are here.

STATEMENT OF WARREN D. NOTEWARE, COMMISSIONER, CALIFORNIA ENERGY COMMISSION, ACCOMPANIED BY MIKE JACKSON, CONSULTANT; ERIC VAUGHN, PRESIDENT AND CHIEF EXECUTIVE OFFICER, RENEWABLE FUELS ASSOCIATION; MICHAEL BALY III, VICE PRESIDENT FOR GOVERNMENT RELATIONS, AMERICAN GAS ASSOCIATION; AND CLARENCE DITLOW, EXECUTIVE DIRECTOR, CENTER FOR AUTO SAFETY

Mr. NOTEWARE. Well, thank you very much. We are certainly proud of what we are doing, too, and we are especially grateful for what you have accomplished, you and the cosponsors of S. 1518. We think it is a very important piece of legislation. It will permit us in California to continue with what we have been trying to accomplish. It contains the incentives which are a very straightforward approach, very logical. We have no problems with the dates that the bill contains.

We have absolutely no suggestions for improving this piece of legislation.

Now, it is especially important to us in California because we are literally the third largest consumer of gasoline in the world. In other words, if California were a country, the only other two countries that use more gasoline would be the rest of the United States and the Soviet Union. We use about 14 billion gallons of gasoline every year. So it is important to us from that respect, from the standpoint of our fuel security.

California experienced major disruptions in the 1970s when there was only a 3 percent shortfall in petroleum supply. At that time we were using a lot of petroleum to generate electricity, and we have been able to wean ourselves away from that somewhat in that at that time, par-

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ticularly in the bad hydro years, almost 70 percent of our electric generation was with oil and natural gas. Now it is down to less than 30 percent. So we have been effective in that area. But we still have not been able to accomplish anything in our transportation sector.

Our role in diversification of generation has not really happened in the transportation sector, and we feel that S.B. 1518 is a means to make this possible.

Our other problem is that we have many major urban areas that cannot meet Federal air quality standards by the December 31 deadline. Increased economic growth and increases in annual vehicle miles traveled will mean further deterioration of California's air quality without significant reductions in vehicle exhaust emissions.

We have long been interested in low emission fuels which can reduce our dependence on imported oil and help in alleviating our air quality problems. There are a number of alternatives which can provide these benefits, such as electric vehicles, compressed natural gas vehicles, even eventually probably hydrogen vehicles and things that we might not even have considered, have not been invented yet. But many of the technologies for reduced petroleum dependence have more serious problems than the methanol vehicles, particularly the flexible fuel vehicles.

In California we have also been working on other issues like telecommuting, trying to encourage ride sharing, even small things like coordinating stop signs and everything we can possibly think of to reduce the pollution problems that are inherent with the use of gasoline.

Methanol has a potential to provide so much emission and fuel security benefits with the least difficulty involved in changing over from petroleum-based fuels. We certainly admit that there are some disadvantages and potential concerns that need to be recognized and addressed: first, the cost of methanol and methanol vehicles; second, air quality implications; third, emissions from methanol; and fourth, other environmental impacts such as impacts on water quality.

To deal first with the cost of methanol, we have found that there is adequate short term supply of inexpensive methanol such that programs using flexible fuel vehicles can be cost effectively initiated now. In the future, though, we see that there will probably be increases as we use up the short term methanol surplus, and new methanol plants will have to be built. The price of methanol from these plants is bound to be higher, and we estimate a cost growth of about 1.6 percent per year. And we do not know what the price of gasoline is going to be over this period of time, but our best projection is that that would probably be about the same time.

The estimates for the cost differential between gasoline and methanol vehicles range from $200 to $500 per vehicle if the production runs can be in the neighborhood of 100,000 vehicles or more.

Regarding air quality benefits, the Air Resources Board, South Coast Air Management District and other air quality control districts in California all believe that with light duty vehicles we can significantly reduce ozone. That is based on a series of ozone modeling studies per-

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formed for the Los Angeles areas. Assessments of hydrocarbon reduction measures indicate that further reductions in emission standards for gasoline vehicles and expanded inspection and maintenance programs will not be sufficient for many California urban areas to attain and maintain the ozone standard beyond the year 2000. Therefore, additional clean fuel strategies will be essential.

In addition, methanol can help mitigate the global warming problem, or the greenhouse effect, because the main contributor to global warming is carbon dioxide, and methanol actually produces fewer grams per mile of carbon dioxide than gasoline.

Regarding water quality benefits, methanol solubility in water is really not considered a serious threat because methanol in the soil tends to be destroyed by microorganisms more than gasoline and oil and benzene. And in the event of major spills in the ocean, it could cause some real problems to the fish in the immediate vicinity, but it is dissolved in water so fast that it would have no long term serious effect.

In the summer of 1987, California received seven Ford flexible fuel vehicles, just like the one that is parked out in front. I had the opportunity to drive one, and my experience with that vehicle was very positive. I am sure it runs actually better on methanol than it does on gasoline, although it runs actually very well on gasoline or any combination of the two. If we can get Ford's permission and the Highway Patrol's permission, we would like to take these vehicles out on a test track and try to document with a stop watch exactly how much better they will run on methanol than on gasoline. I think that would be an important thing to know. At the present time it is just kind of by the feel in the seat of the pants.

Now, the Energy Commission has received about $5 million in petroleum violation escrow account—that is the PVEA funds—to expand our methanol vehicle demonstration. Of these funds, $2 1/2 million are committed to a demonstration of methanol-fuelled trucks and the establishment of an emission test facility to support this demonstration, and methanol bus demonstrations in Los Angeles and Riverside.

The other $2 1/2 million will be used for light duty methanol vehicle demonstrations, including expanding our existing refuelling station network and large scale demonstration of flexible fuel vehicle technology. We are striving to place up to 5,000 additional flexible fuel vehicles on the road in the nonattainment areas in California.

The need for energy security and air quality improvements in this country requires that we in government encourage the use of alternative transportation fuels. Legislation such as that before us today can provide the incentive need to encourage manufacturers to produce vehicles which can utilize alternative fuels.

And again, we applaud you, Senator Rockefeller, and all your cosponsors because of the approach to limiting the CAFE credit for dual-fuel vehicles. This approach correctly separates the automotive manufacturers from quantities of fuel actually used, and therefore provides a predictable and quantifiable incentive that will encourage the production of these vehicles.

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Now, there was an article in the Wednesday, November 11, 1987 Sacramento Bee, "Converting City Fleet to Methanol Wins Backing" which states that the City Council Budget and Finance Committee of Sacramento has agreed to convert the city's 1675 vehicles to methanol, providing it can be worked out. That is the police vehicles, the pickups and so forth. One of the quotes here is that with methanol the City has the opportunity to be on the leading edge in efforts for cleaner air in the region.

Also, I might mention that we have prepared a methanol fact sheet which we would like to make available. It is a very objective look at the pros and cons of methanol, and as a matter of fact, it certainly agrees in most areas with the testimony that we heard this morning from Dick Wilson of EPA.

Now, I have with me today Mike Jackson, who is our consultant, so if in the question period you ask me some things that I need some help on, he is here to help me.

So again, I appreciate the opportunity.

[The statement follows:]

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STATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

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Testimony before the
U. S. Senate
Committee on Commerce, Science and Transportation
Consumer Subcommittee

WARREN D. NOTEWARE
Commissioner
California Energy Commission

November 12, 1987

Mr. Chairman, members of the Committee, thank you for this opportunity to discuss California's experiences with alternative fuels and support Senator Rockefeller's efforts to encourage the manufacture and use of alternate fuel vehicles.

CALIFORNIA'S INTEREST IN METHANOL

California is the third largest consumer of gasoline in the world. Our transportation sector is 99 percent dependent upon petroleum-based fuels, a dependence which consumes 74 percent of the state's annual petroleum supply. With crude oil imports expected to reach or exceed 50 percent by the mid-1990s, California's transportation system will again be subject to major impacts in the event of an oil supply disruption. California experienced major disruptions during the 1970s with only a three percent shortfall in petroleum supply to California.

California's major urban areas will not meet federal air quality standards by the December 31, 1987 deadline. Although improvements in mobile and stationary emission control technology has improved air quality in areas such as the Los Angeles Basin in recent years, we still fall far short of attainment levels in these areas. Increased economic growth and increases in annual vehicle miles traveled will mean further deterioration of California's air quality without significant reductions in vehicle exhaust emissions.

California has long been interested in low-emission fuels which can reduce our dependence on imported oil and help in alleviating our air quality problems. We feel that there are a number of alternatives which can provide these benefits, such as electric vehicles and compressed natural gas vehicles. Both technologies provide complimentary strategies for improved emissions and reduced petroleum dependence, primarily with fleet

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operations. Hydrogen-powered vehicle technology does not appear to be technically nor economically feasible in the near future. We feel that alcohol-powered vehicles, particularly methanol-powered vehicles, offer California, and the nation as a whole, the most reasonable chance at reducing motor vehicle emissions and reducing our dependence upon foreign oil sources. Methanol, because it is a liquid with a ubiquitous domestic and international resource base, offers the most cost-effective long-term replacement to petroleum. Ethanol should also be an important of our efforts to diversify our liquid fuel sources.

BENEFITS OF METHANOL

Methanol has the potential to provide emission and fuel security benefits with the least difficulty involved in changing over from petroleum-based fuels. Methanol is a chemically simple liquid fuel, which can be easily adapted to existing motor vehicle technology and fuel supply infrastructure and has been demonstrated to be easily accepted by consumers. The current oversupply of methanol in the world can adequately handle the gradual introduction of methanol vehicles into the nation's vehicle fleet. Existing and proposed production capacity can continue to supply the fuel throughout the changeover process. This can be accomplished at economically competitive prices, on an energy equivalent basis with petroleum-based fuels, once methanol demand rises to the level which permits bulk fuel shipments by tanker or pipeline.

There are some disadvantages and concerns that need to be recognized and addressed before methanol is widely used as a fuel. The major disadvantage with methanol is its lower energy content compared to gasoline (2 to 1) and diesel (2.3 to 1) However, the high octane and added performance characteristics of methanol are likely to compensate for this disadvantage. Other concerns are: (1) the cost of methanol and methanol vehicles, (2) air quality benefits of methanol, (3) emissions from methanol, and (4) other environmental impacts of methanol, such as impacts on water quality.

Cost of Methanol

We have found that there is adequate short-term supply of inexpensive methanol such that programs using flexible fuel vehicles can be cost-effectively initiated now. Current supplies of methanol are sufficient to meet national demand through the late 1990s, and the price will be very competitive with premium gasoline even if it is shipped in small tankers Even with vehicle populations as low as 30,000, methanol can compete effectively with premium gasoline. Higher volume demand will make methanol even more price-competitive.

In the future, as demand increases and we use up the short-

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term methanol surplus, new methanol plants will be built. The price of methanol from these plants, however, will be higher. We estimate a cost growth of 1.6 percent per year which matches projections made by oil companies such as Chevron for oil price increases over the same period. We project, therefore, that methanol can be a cost-effective transportation fuel for air quality and energy diversification over the next 10 years and further, that long-range methanol prices will also be competitive with future gasoline prices.

The estimates for the cost differential between gasoline and methanol vehicles range from $200 to $500 per vehicle in production runs of 100,000 vehicles or more. This cost increase is reasonable in view of a recent survey performed by the Institute of Politics and Government at the University of Southern California, which indicates that consumers are willing to pay a premium for low emission vehicles; up to $500 per vehicle and one-half cent per gallon for fuel.

Air Quality Benefits

CEC believes that the combination of emission testing evidence and ozone modeling results clearly supports methanol as a broad-based, integrated, air quality control strategy. With light-duty vehicles, CEC expects significant reductions in ozone, based on a series of ozone modeling studies performed for the Los Angeles area. An evaluation of the ozone effect is currently being performed for the California Air Resources Board by Carnegie-Mellon University. Assessments of hydrocarbon reduction measures indicate that further reductions in emissions standards for gasoline and expanded inspection and maintenance programs will not be sufficient for many California urban areas to attain and maintain the ozone standard beyond the year 2000. Therefore, clean fuel strategies will be essential.

Emissions

There have been some concerns expressed regarding emissions of methanol vehicles compared to those of gasoline vehicles. While it is true that the current generation of dedicated methanol passenger cars produces more formaldehyde emissions than current gasoline vehicles, automotive manufacturers have demonstrated that these emissions can be controlled to levels as low as current gasoline vehicles. Preliminary operating data for California's flexible fuel vehicles indicates that the emissions of these vehicles can meet all current California standards. Evaporative emissions in flexible fuel vehicles have been tested and they meet or exceed the standard in worst case mixtures (2 percent methanol through 50 percent methanol).

In addition, methanol can help mitigate the global warming problem, or the "greenhouse effect." The main contributor to

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global warming is CO_2, which is produced whenever hydrocarbon fuels are combusted. CEC analysis shows that methanol actually produces fewer grams per mile of CO_2 compared with gasoline. Based on complete combustion of the fuel in engines, methanol produces 0.54 pounds per mile of CO_2, which is 14 percent lower than the CO_2 produced from gasoline combustion. When resource extraction, refining, conversion and distribution are factored into the analysis, the total CO_2 for methanol from natural gas is about 0.70 to 0.87 pounds per mile The total for gasoline using similar analysis is 0.83 to 0.92 pounds per mile Additional improvements over gasoline can be credited to methanol as oil field associated gas (typically flared or reinjected) is converted to methanol.

Water Quality Benefits

Methanol solubility in water is not considered a serious threat. Dr. Peter D'Eliscu, an environmental consultant, has stated that soil microorganisms biologically destroy methanol in subsoil and aquifer environments. Therefore, it would be almost impossible for release of methanol from underground storage tanks to contaminate drinking water.

CALIFORNIA'S METHANOL PROGRAM

The California Energy Commission's Alternative Fuels Demonstration Program started in 1978 with field evaluations of relatively small volumes of alcohols blended with gasoline (low level blends). In 1981, the program focused on the use of neat methanol and ethanol (85 to 90 percent methanol and 10 to 15 percent gasoline) in manufacturer-designed vehicles optimized to take advantage of these clean, high-octane fuels. In 1982, the CEC began a test of methanol heavy-duty engines with a demonstration of methanol-powered transit buses. These buses continue to operate in daily transit service with the Golden Gate Transit District in Marin County, California. In 1983, the program further specialized its interest in a test of more than 500 methanol-powered Ford Escorts and the initiation of a methanol fueling station network.

Although the initiation of methanol fueling stations provided a limited refueling network, the lack of widespread fuel accessibility has severely hampered the market introduction of methanol vehicles. To address this problem, the California Methanol Program is initiating an expansion of the existing fueling network and a demonstration of "flexible fuel vehicles."[1] Flexible fuel vehicles can offer a new dimension to alternative fuels. With fuel flexibility mass-produced automobiles can be sold in areas

[1] Note that while "flexible fuel vehicles" is a term associated with Ford Motor Company, it is used here to refer generically to vehicles that can use gasoline, methanol, or ethanol.

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where methanol is not distributed, providing a hedge against oil shortages. In addition, in areas where national ambient air quality standards are not met, methanol can be marketed in competition with gasoline, providing both benefits of improved air quality and energy diversity.

In the summer of 1987, California received seven Ford flexible fuel vehicles, which are capable of operating on alcohol fuel, gasoline, or any blend of the two. These vehicles represent the current state-of-the-art alcohol cars in the world. We are looking forward to the arrival of a Chevrolet Corsica variable fuel vehicle this winter.

FUTURE CALIFORNIA METHANOL PROGRAMS

California's Alternative fuels Demonstration Program is continuing to evolve. The Energy Commission has entered into public/private partnerships with the Atlantic Richfield Company (ARCO) and Chevron USA. These partnerships will add another 50 methanol fuel stations to the 20 previously established by our program. These agreements represent the first commitments by major oil companies to distribute fuel methanol. Collectively, ARCO and Chevron represent approximately 40 percent of the motor fuel market west of the Rocky Mountains. In addition to establishing fueling stations, Chevron will provide research support to the methanol vehicle demonstrations, and will provide assistance in the analyses of health and environmental issues and economic issues.

The Energy Commission has received $5.0 million in Petroleum Violation Escrow Account (PVEA) funds to expand our methanol vehicle demonstrations. Of these funds, $2.5 million are committed to a demonstration of methanol-fueled trucks and the establishment of an emission test facility to support this demonstration and methanol bus demonstrations in Los Angeles and Riverside, California

The other $2.5 million will be used for light-duty methanol vehicle demonstrations, including expansion of our existing refueling station network and large-scale demonstration of flexible fuel vehicle technology. We are striving to place up to 5,000 additional flexible fuel vehicles on the road in non-attainment areas in California.

LEGISLATIVE INITIATIVES

We feel that the need for energy security and air quality improvements in this country requires that government encourage the use of alternative transportation fuels. We feel that legislation such as that before you today can provide the incentive needed to encourage manufacturers to produce vehicles which can utilize alternative fuels.

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The Rockefeller legislation provides credits to the Corporate Average fuel Economy (CAFE) for both dedicated and dual fuel vehicles. There is no limit on the credits for dedicated vehicles. For dual fuel vehicles the credits are limited by a factor to account for the estimated fraction of vehicles that use alternate fuels and also by a "cap" to limit the credit in case the actual fuel use turns out to be lower than assumed in the fraction.

Based on our experience, we believe that CAFE incentives are required before automotive manufacturers will take the necessary risk and financial investment to produce alternate fuel vehicles at a price acceptable to consumers We have wrestled with the question of credits for dual fuel vehicles and believe the Rockefeller legislation provides both the necessary incentive to the automotive manufacturers and the continued philosophy of fuel conservation embodied in CAFE. We do not currently see a practical way to tie the amount of credit to the amount of fuel used. We feel this introduces too much complexity and possible disincentives to the automotive manufacturers by asking them to assume the risks on how the vehicle is used or how alternate fuels are marketed.

We instead applaud Senator Rockefeller's approach to limiting the CAFE credit for dual fuel vehicles. This approach correctly separates the automotive manufacturers from quantities of fuel actually used and, therefore, provides a predictable and quantifiable incentive that will encourage the production of these vehicles. Based on our experience, dual fuel vehicles are necessary during the early transition stages as alternate fuel retail stations are being deployed. We further believe that dual fuel vehicle use will provide the necessary supply and price competition to petroleum fuels. The addition of dual fuel vehicles to the existing fleet will also provide security against petroleum supply disruptions.

The original purpose of CAFE was to back out crude oil consumption. This has been successful; the U.S. Department of Energy estimates that one million barrels of oil per day has been saved. These savings are not enough. Gasoline consumption, and therefore, oil imports are on the rise. As consumption and imports increase, California and the rest of the nation will continue to be vulnerable to supply disruptions. Many parts of our nation face critical air quality problems. We feel that CAFE will provide the lowest cost (to taxpayers) incentive with the least government regulatory involvement to the automobile manufacturers to provide sufficient methanol vehicles, at a price attractive to consumers, to boost the fledgling methanol marketplace.

Senator ROCKEFELLER. Thank you, Commissioner, and I wanted to make note of Mike Jackson, that he was here and is an expert consultant to you.

I also should make note of the fact that you did not have an exactly very easy time getting here yourself. Perhaps neither of you did.

Mr. NOTEWARE. That is right.

Senator ROCKEFELLER. Mr. Baly.

Mr BALY Thank you, Mr. Chairman, Senator McCain.

I am Mike Baly, Vice President of the American Gas Association. AGA represents 300 natural gas distribution and transmission companies which account for over 80 percent of the nation's total annual gas utility sales.

Our scheduled witness, Leo Thomason from Nevada and Arizona, made it as far as St. Louis and could not fly into D.C., but commends you and the Senator for your leadership on this issue.

Being a native West Virginian, I am pleased to represent AGA at this hearing. We commend you, Mr. Chairman, and Senator McCain, for your leadership on this bill because we believe the CAFE standards provide a solid incentive for the expanded use of natural gas vehicles

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and other alternative fuel vehicles. The CAFE standards provide the necessary incentives for manufacturers to produce alternative fuel vehicles on a large scale. Natural gas vehicles can contribute to improved air quality and decrease our country's reliance on imported energy for transportation fuels.

Natural gas is cheaper, cleaner and safer than gasoline and most alternative fuels. It sells for 41 cents to 75 cents a gallon. It is lead free, no carbon monoxide, sulfur oxide, no particulates, and its ignition temperature is one half that of gasoline.

We support your higher credit for dedicated vehicles over dual-fuel vehicles because we believe that will increase more the NOx reduction and the energy performance which EPA cited. EPA is now testing a dedicated vehicle at its laboratory in Michigan.

As Senator McCain knows, Southwest Gas, which serves over 720,000 customers in Arizona, Nevada and California, is an excellent example of the industry's commitment to promoting alternative fuel technology. They have recently opened up the world's largest natural gas refuelling station in Las Vegas, capable of refueling about 1,000 vehicles per day to serve their company's vehicles and customers.

In the wake of a bill which the Arizona Senate recently enacted which provides for the improvement of air quality, a joint legislative committee is considering a proposal to establish a tax credit and other incentives to encourage private vehicle owners to convert their pre-1981 cars to alternate fuels. As many as 10,000 vehicles could be converted to clean-burning natural gas. $400,000 of this proposal is earmarked to convert the state's fleet to natural gas. Arizona State University will be looking to outside vendors to promote vehicle conversion equipment and building a refueling station to carry out this mandate.

You are probably aware, Mr. Chairman, that Hope Gas Company in Clarksburg has at least 10 natural gas vehicles operating today, and one of the nation's expert converters of alternate fueled vehicles with whom we have worked is located in Martinsburg, East Coast Conversions. Also, in neighboring Lexington, Kentucky, the Postal Service is planning to convert its fleet to alternative fuels, including natural gas. So this is very important to your state and Appalachia.

Let's put in perspective the vehicle market for natural gas, some of the questions that Senator Danforth was asking. It is important to remember that relying on natural gas as a transportation fuel will not jeopardize the availability of the huge domestic supply of natural gas for other purposes. According to the Department of Energy's recent Energy Security Study, natural gas in this country is in sufficient supply to last another 250 years and is the fuel that could best be used as a substitute for foreign oil. This will help reduce the need for present transportation fuels which represent about two-thirds of the oil consumed today in the U.S.

Today there are 30,000 natural gas vehicles in this country. They use only 3 billion cubic feet of gas a year. This is .02 percent of the gas consumed in this country last year, .02 percent. Now, the gas industry very optimistically hopes to market, 22 years from now, in the year 2010,

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about 1 million natural gas vehicles of the over 10 million fleet vehicles. Now, these 1 million natural gas vehicles will still consume only .5 percent of today's sales levels; .5 percent of today's sales levels 22 years from now.

Senator McCain mentioned Brazil. We have been informed that Russia recently announced a program to convert 1 million vehicles to natural gas by 1990 and develop an industry to manufacture natural gas vehicle equipment. The best we could foresee doing that in this country is over 20 years from now.

Also, gas supplies by the turn of the century will be supplemented by gas from unconventional domestic sources, tight formations, Devonian shale and coal seams, all important gas sources from Appalachia.

Finally, Mr. Chairman, we appreciate your staff's assistance in modifying the provision allowing for suspension of CAFE credits. As we have demonstrated, the supply of natural gas is so plentiful and its use for fleet vehicles so small that no increase in prices charged to consumers will result.

We strongly support S. 1518 because it provides incentives for manufacturers to produce alternate fuels like natural gas vehicles by including a credit for these vehicles in the calculation of the Corporate Average Fuel Economy standard. When you convert natural gas to methanol, you lose 50 percent of the energy content. So we appreciate your inclusion of natural gas use directly.

Thank you for this opportunity to testify.

Senator ROCKEFELLER. Thank you very much, Mr. Baly.

[The statement follows:]

STATEMENT OF LEO B. THOMASON, II, VICE PRESIDENT, MARKETING AND CONSERVATION, SOUTHWEST GAS CORPORATION ON BEHALF OF THE AMERICAN GAS ASSOCIATION INTRODUCTION

Mr. Chairman and members of the subcommittee: My name is Leo B. Thomason, II and I am Vice President, Marketing and Conservation of the Southwest Gas Corporation, which serves 721,000 customers in Nevada, Arizona and California. I also currently serve on the Marketing Managing Committee of A.G.A. I am accompanied today by Mike Baly, the Vice President for Government Relations of A.G.A.

The American Gas Association is a national trade association comprising about 300 natural gas distribution and transmission companies. These companies account for approximately 81 percent of the nation's total annual gas utility sales. I am pleased to present the views of our industry on S. 1518, the Methanol and Alternative Fuels Promotion Act of 1987.

This subcommittee is aware of the problems that urban communities have encountered in meeting the Clean Air Act's ozone and carbon monoxide standards. It is our view that the use of low emission fuels, such as natural gas, in vehicular sources is a sound approach for addressing these problems and should be encouraged as part of the comprehensive solution. In this regard, A.G.A. commends Senator Jay Rockefeller (D-WV) for including language that will encourage automobile manufacturers to produce vehicles fueled by natural gas. Permitting natural gas and other alternative fuels to be included in the calculation of corporate average fuel economy (CAFE) standards presents a sound and reasonable approach to improving air quality and increasing reliance in the plentiful domestic supply of natural gas. Moreover, this approach allows our nation to pursue these two policies at no cost to the Federal Government, since no budget outlays are necessary to provide CAFE credits for alternative fuel vehicles. Including NGVs in the calculation of CAFE standards should also help to

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overcome an institutional barrier to natural gas vehicle (NGV) use in this country: few entrepreneurs are willing to offer natural gas at a refueling facility until many more NGVs are on the road, and vehicle operators will not place NGVs in service until more refueling stations are available. By encouraging the production of NGVs, S. 1518 will provide incentives to place refueling stations in service. S. 1518 is complemented by H.R. 3399, a House bill that A.G.A. endorses since it would also help to overcome institutional barriers to the use of alternative fuels in vehicles.

Because S. 1518 can provide a valuable contribution to the proliferation of NGVs in this country, A.G.A. supports this bill. The benefits that A.G.A. foresees from the enactment of this bill include improved air quality and increased reliance on a secure, domestic transportation fuel. From a national energy policy perspective, these benefits should be sought by the Federal Government. The CAFE credits in this bill complement state efforts such as Arizona Senate bill 1360, which was enacted last May. While S. 1518 provides incentives for manufacturers to produce NGVs, Senate bill ?360 mandates that such vehicles (or other alternative fuel vehicles) be used in certain geographic areas to facilitiate compliance with the Clean Air Act. The attributes of NGVs in a number of areas are discussed below.

ENVIRONMENTAL OUALITIES

Natural gas use in vehicles can significantly reduce emissions of carbon monoxide, nitrogen oxides, reactive hydrocarbons, particulates, and carbon dioxide. Although little other data comparing the emissions of dedicated NGVs with new vehicles are available, the Brooklyn Union Gas Co. has tested the emissions from two new natural gas fueled bus engines in an EPA-approved test laboratory. The emissions were far below the EPA 1994 heavy duty diesel engine standards. The results showed that the gas engines produced about half of the diesel particulates allowed in the 1994 standard; 25 percent of the carbon monoxide; 12 percent of the nitrogen oxides; and 24 percent of hydrocarbons. These engines were shipped recently to the EPA laboratory in Ann Arbor, Michigan for further testing by EPA.

Furthermore, the contribution that NGVs can make to improved air quality is already evident with respect to vehicle conversions. Conversion of gasoline or diesel fueled vehicles to natural gas can reduce CO emissions by up to 99%, reduce NOx emissions by up to 65%, and reduce reactive hydrocarbon emissions by up to 85%. Actual emissions reductions achieved depend upon a large number of factors, including tuning, age and design of the vehicle, and the condition and technology of the gasoline emissions controls and natural gas conversion kit.

A.G.A. estimates that conversion of each 1 million cars (approximately 6.2 percent of U.S. fleet vehicles) to natural gas could reduce CO emissions by up to 223,000 tons/year, reduce NOx emissions by up to 27,000 tons/year and reduce hydrocarbon emissions by up to 11,000 tons/year. These vehicles would use less than 100 Bcf of natural gas per year—one half of one percent of annual U.S. natural gas production.

NGV SAFETY

Natural gas, by its nature, is inherently an extremely safe vehicle fuel. Natural gas is lighter than air and, therefore, unlike gasoline or methanol, does not form a volatile puddle or pool if it leaks from a vehicle. Ignition of natural gas in the event of a leak could occur in only very limited conditions. Natural gas ignites in a very narrow range of gas-to-oxygen, about a 5 percent to 15 percent mixture. The flammability range is between 1200o(F) to 1300o(F), this temperature being twice as high as the temperature at which gasoline is flammable.

In addition, the fuel tanks for NGVs are typically reinforced composite aluminum cylinders wrapped in fiberglass or three-quarter-inch-thick steel cylinders. In passenger automobiles these cylinders are generally positioned in the rear of the vehicle and filled with compressed natural gas.

Because of these attributes, when natural gas vehicles are involved in accidents, the injury and death incidence rates per vehicle mile traveled are significantly lower than comparable incidence rates for the entire population of registered U.S. vehicles. According to a recent A.G.A survey of fleet managers whose fleets are at least partially composed of NGVs, NGV fleet injury rates per vehicle mile traveled were 84% less than the national average for injuries per vehicle mile traveled for all U.S. registered vehicles. In addition, no deaths occurred in the cumulative 434.1 million miles driven by the sample fleet.

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The public refueling system for NGVs can also be operated very safely. The U.S. already has a one-and-half million mile underground pipeline system that is used to transport natural gas and nearly 300 refueling stations available for compressed natural gas refueling. This pipeline transportation system would allow natural gas to be delivered to vehicles safely and efficiently without encountering the risks inherent in transporting liquid fuels over surface roads. Only minor additional pipe as well as a compressor and high pressure storage equipment is needed for the installation of a refueling station.

ECONOMIC ADVANTAGES

Economic attributes of NGVs include: 1) a fuel cost equivalent to saving 50 cents per gallon or more (even at today's relatively low price spread), which provides an acceptable payback for refueling station construction for large consumption fleets; 2) reusable equipment that can be reinstalled in replacement vehicles over and over again; and 3) reduced maintenance costs, including a reduction in spark plug changes, exhaust system repairs, and oil and filter changes.

From an economic and efficiency standpoint, NGVs, in many applications, offer advantages over gasoline and other alternatively-fueled vehicles. According to a recent A.G.A. study of economic efficiency of alternative fuel vehicles (copy attached), for a representative 100 vehicle fleet, NGVs were found to enjoy an 11 percent operating cost savings relative to gasoline (5.6 per mile versus 6.3 per mile), on a national average.

SUPPLY OF NATURAL GAS

The domestic supply of natural gas is huge. According to estimates from the latest Potential Gas Committee (PGC) assessment, conventionally recoverable gas at year-end 1986 in the lower 48 states (including proved reserves) was 779 Tcf. The Energy Information Administration (EIA) estimates proved reserves of gas in the lower 48 states at year-end 1986 to be 159 Tcf. Thus, the remaining recoverable resource would provide nearly a 50 year supply of gas at consumption rates experienced in 1986 (approximately 16 Tcf). As noted in its energy security study, the. Department of Energy found that a 250 year supply of natural gas, including unconventional sources, exists in this country.

To place this huge supply in perspective, under the most optimistic scenario, the gas industry hopes to market approximately one million NGVs by the year 2010. Even at today,s low consumption rate for natural gas, these one million NGVs would only increase domestic gas consumption by six-tenths of one percent. Current use of natural gas in the 30,000 NGVs in this country averages about 100 mcf per vehicle, or approximately 3 Bcf annually nationwide. Clearly, this is a miniscule portion of overall natural gas sales.

Moreover, gas supplies by the turn of the century will be supplemented by gas from unconventional domestic sources. The potential gas resource associated with these supplies is significant. For example, tight formations may contain a recoverable resource of 500 Tcf; Devonian shales—225 to 1,800 Tcf; and coal seams -- 800 Tcf. Estimates of future production from tight formations, Devonian shales and coal seams depend upon a number of economic and technological factors. A.G.A. projects that total production from these sources in the year 2000 will range from 1.6 Tcf to 3.7 Tcf and in the year 2010 from 3.3 Tcf to 7.5 Tcf. In addition to those gas supply sources in the lower 48 states, there are a number of sources which will supplement future supplies of gas. For example, pipeline imports from Canada, and eventually Mexico, are expected to contribute to the diverse mix of future supplies. Imports from the vast world gas resource in the form of liquefied natural gas (LNG) may also be anticipated. Alaskan gas, which will require a transportation system for delivery to the lower 48 states is expected to be available around the turn of the century.

Other unconventional sources could also supplement domestic natural gas supply in future years. These sources include gas from landfills, peat, coal and oil shale gasification, geopressured reservoirs, biomass, and gas from hydrates. Thus, although the bulk of our future supply will continue to come from the lower 48 states, there is a tremendous diversity of sources from which future supplies will come.

The price outlook for natural gas is also favorable. The average field price of natural gas reached a peak in 1983 (on an inflation-adjusted basis), and has been declining for

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three years. Field prices of some new gas, especially from wells more than fifteen thousand feet deep that Were decontrolled in 1980, began to fall even earlier. Average retail prices (inflation-adjusted) also reached a peak in 1983. A.G.A. does not expect average retail gas prices to return to the levels of a few years ago until the end of the century.

Because the supply of natural gas is so plentiful, A.G.A. does not anticipate that the Secretary of the Department of Energy would ever invoke the CAFE suspension provision since the increased demand for gas would be too slight to influence the price paid by consumers. We appreciate your support in ensuring that auto manufacturers who might produce NGVs would not experience significant capital costs for retooling if the provision were invoked. Otherwise, natural gas might be at an unfair competitive disadvantage.

CONCLUSION

S. 1518 represents a well-reasoned proposal that helps to set our country on-the course of a sound energy policy. By encouraging auto manufacturers to produce NGVs, the bill sets in motion a progression of events that should lead to increased reliance on a secure, domestic energy supply for transportation purposes and improved air quality. We believe, therefore, that S. 1518 presents a sound national policy that should be implemented. For these reasons, A.G.A supports the bill and pledges our assistance to work with the subcommittee as legislation continues to evolve in the coming months.

Senator ROCKEFELLER. Mr. Vaughn?

Mr. VAUGHN. Senator Rockefeller, I want to thank you very much for the opportunity to testify before your subcommittee today. My name is Eric Vaughn, and I am the President of the Renewable Fuels Association. We represent approximately 84 operational ethanol production facilities located in 29 states all across the country today.

The ethanol industry in the United States essentially began as a part of a national energy program designed to address serious energy problems visited on our country in the late 1970s. From 1980 through 1987, we have seen ethanol industry growth from approximately 10 million gallons of production capacity to over a billion gallons of ethanol production capacity today.

This year alone the U.S. ethanol industry anticipates marketing and sales of approximately 800 million gallons of ethanol, enough ethanol to produce 8 billion gallons of gasohol being sold in 42 States all across the United States. This represents 8 percent of all the gasoline marketed in the United States today.

Since 1980, over 500 billion miles have been driven by consumers on ethanol blends. That is 500 billion miles. And all domestic and foreign auto manufacturers currently selling and manufacturing cars in the United States fully warranty 10 percent ethanol blends.

Senator Rockefeller, the domestic ethanol industry is enthusiastically supportive of your legislation, Methanol and Alternative Fuels Production Act. And our support is based on our industry's interest to see the alternative fuels industry in the United States grow. Your legislation would provide the incentive to find new solutions to environmental, national energy security and economic development problems facing our country. In addition, your legislation will provide incentives for U.S. auto manufacturers to produce neat or near-neat alcohol-fueled vehicles, and to begin to capture some of the imaginative and very productive work going on in countries all around the world, such as Brazil.

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Someone asked a question earlier this morning about the Brazilian alcohol fuel experience, how did Brazil do it? Brazil did it because they faced the same energy security threat that we faced in the early 1970s and we continue to face today. Over 3 million cars have been produced in Brazil to run on 100 percent ethanol. The average consumption, the average ethanol content in motor fuel in Brazil today is 23 percent per gallon.

I have visited Brazil and have driven these alcohol fuel cars. They are in fact made by some very exotic auto manufacturers such as Ford and General Motors, and they are in fact some of the highest performance automobiles that I have ever had the opportunity to drive. I have also driven the Ford Automobile Company flexible fuel vehicle, and an alcohol automobile that is being driven around Washington today that is owned by Boyden Grey, a counselor to the Vice President. His car is operating on a 50-50 ethanol-methanol mix. In my opinion there is not a car in Washington or in the entire metropolitan area that could touch his for performance and driveability.

I notice that Roberta Nichols from the Ford Motor Company is here, and I would be remiss if I did not state publicly on behalf of our industry our thanks to her for all of her leadership and dedicated support on behalf of alchol automobiles. If we had more Robertas around, we would not be debating this issue, we would be out producing flexible fueled vehicles and buying these cars in the marketplace today.

Senator ROCKEFELLER. That is correct.

Mr. VAUGHN. I would hasten to add, something that Brazil is not alone in, efforts to establish an alcohol fuel industry. In fact, we are alone in looking at the future. We have decided that our energy future lies in a 300 mile wide body of water known as the Persian Gulf, and we are going to defend that gulf and Iran's right and ability to export oil that we will gladly buy at inflated price. Brazil, Japan, Korea, Germany, Sweden and even Australia are spending more on alternative fuels technology and the development of that technology than the United States at this time.

We have leaders in Washington, you, Senator Rockefeller, at the top of that list, proposing that this nation take ahold of the future and address it actively and aggressively.

I would point out, that there are a number of misunderstandings about alternative fuels. Many, I am sure, are presented by people with the highest of intentions, but the objective and the impact is very clear to scare or frighten consumers away from the use of alternative fuels.

About six to eight months ago a group of energy consultants, automobile engineers, vocational training program directors produced a manual that I would suggest be made available for all of your committee members and staff. It is titled "Changes in Gasoline, the Automobile Service Technician." It was written for a number of reasons, but primarily to provide facts, to provide information about the three most asked questions about alcohol fuels, driveability, volatility and fuel materials compatibility.

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The manual is very clearly written for the automobile mechanic, and it has been distributed to over 250,000 people in the past seven months free of charge, and we have had nothing but rave reviews regarding this manual and its content.

Senator, in the interest of time, I would ask that my formal comments be added to the record, and I would be happy to answer any of your questions after the close of the testimony.

Senator ROCKEFELLER. It will be done, Mr. Vaughn, and I thank you very much.

[The statement follows:]

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TESTIMONY OF

ERIC VAUGHN

PRESIDENT & CHIEF EXECUTIVE OFFICER

RENEWABLE FUELS ASSOCIATION

BEFORE THE

SENATE COMMITTEE ON COMMERCE, SCIENCE & TRANSPORTATION

CONSUMER SUBCOMMITTEE

WASHINGTON, D.C.

NOVEMBER 12, 1987

INTRODUCTION

My name is Eric Vaughn, President and Chief Executive Officer of the Renewable Fuels Association, the national trade association for the domestic ethanol industry. The Renewable Fuels Association represents nearly all of the nation's domestic ethanol producers. We also represent equipment manufacturers, state government organizations, other alternative fuels groups and major farm organizations.

BACKGROUND

During the 1970s, nearly 300 legislative initiatives were passed by state legislative bodies all across the country promoting the production and use of ethanol fuels. By 1979, the federal government had established a variety of incentives to encourage the construction and operation of ethanol production facilities. As a direct result of these federal incentives, over 100 ethanol production facilities were built with a total production sector captiol investment in excess of $2 billion.

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Today the U.S. ethanol industry is capable of producing over one billion gallons of ethanol a year in 84 efficient production facilities located in 28 states. In 1987 alone, the domestic fuel ethanol industry will produce and market over 800 million gallons of ethanol, creating new cash markets for over 330 million bushels of grain, increasing farm income by $900 million and lowering federal farm program costs by $700 million. In addition, ethanol has become one of the nation's premiere octane enhancing additives for today's gasolines. In fact, ethanol represents one of the cleanest burning high performance fuel additives available on the market today. Since 1980, consumers have driven over 500 billion miles on ethanol blended fuels, and every automobile manufacturer in the world recognizes ethanol's performance benefits and provides full warranty coverage for 10% ethanol blends.

CHANGES IN GASOLINE AND THE AUTOMOBILE SERVICE TECHNICIAN

A great deal of misinformation has recently surfaced regarding fuel quality, gasoline composition, and fuel additives. Auto mechanics and consumers alike have found it virtually impossible to maintain a good understanding of the facts pertaining to gasoline composition. Gasoline additives such as aromatics, ethanol, methanol, and methyl tertiary butyl ether (MTBE), are meaningless to the majority of consumers and automotive technicians.

Perceptions of these products are frequently based on limited information obtained from non-technical sources. As a result, numerous myths abound. Some of the more recent examples include the following:

Myth: All gasolines are the same.

FACT: Gasoline specifications offer general parameters on fuel quality and represent compromises so that all the numerous performance requirements may be satsified. Each refiner has a variety of processes available as well as different types of crude-oil to process and finished products to manufacture. While all refiners strive to achieve satisfactory quality they do so in different ways. Therefore, gasoline composition will vary in some degree from one refinery to the next.

Myth: Alcohols are harmful to automobiles and are not covered under vehicle warranty.

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FACT: Consumers and auto service personnel alike often do not differentiate between the various types of alcohols. For instance, 10% ethanol blends, which have over 500 billion miles of proven experience and are covered under the warranty statements of all U.S. models, are often confused with methanol, which has seen only limited use, and is not covered under vehicle warranty of many automobiles.

Myth: Ethanol alone can damage fuel system parts in pre-1975 model vehicles.

FACT: Pre-1975 model vehicles do have components in their fuel system which are not as durable as those which are found in later model years. However, it is a combination of high aromatic gasoline, ethanol, and ether which may contribute to problems in these systems, particularly elastomeric components which were not formulated in anticipation of these ingredients.

Myth: Ethanol causes deposits and fouling of port fuel injectors.

FACT: This is perhaps the best example of misinformation. Port fuel injector fouling results from a variety of circumstances including driving pattern, injector environment, high olefin/diolefin content of gasoline and insufficient detergent levels. All major producers of ethanol treat their ethanol with detergents at a level so that the finished gallon of gasoline to which it is added will keep carburetors and port fuel injectors clean.

While there are other examples that could be mentioned, this sampling demonstrates the problem quite sufficiently.

This confusion and misinformation has led to the need for an effort to educate the public on a variety of fuel quality topics.

"Changes in Gasoline and the Automobile Service Technician" was written with that goal in mind. Realizing that consumers often seek advice on fuel quality from the auto service/repair industry, this manual takes the first step in consumer education. It provides the technicians with a condensed, concise and technically accurate summation on the relationship of fuel quality and vehicle driveability.

The manual contains such timely information as the following:

- How fuel quality is established and controlled
- Recent changes in gasoline composition
- New gasoline components such as ethanol and MTBE
- Octane and fuel volatility
- Fuel system components both metals and elastomers
- Vapor lock and fuel foaming

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- o Fuel system deposits
- o Gasoline additives
- o Warranty coverage information on alcohol blends

The above items are covered in detail and in a format that relates these important topics to vehicle driveabiltiy.

"Changes in Gasoline and the Automobile Service Technician" is based on over 40 technical papers and was reviewed by personnel from the petroleum and automotive industries as well as an automotive instructor. It is the culmination of months of work to provide a needed reference manual to the auto service technician.

The manual will be distributed free of charge to over 140,000 auto service technicians in July, and will also be made available to various organizations such as local colleges and vocational schools for use in their automotive education programs.

CRITICAL TECHNICAL ISSUES

I would now like to address the following issues: 1) the significance of ASTM gasoline volatility standards as they relate to the effect of ethanol blended gasoline; 2) the experience gained thus far with respect to vehicle driveability as influenced by 10% ethanol addition -- and more importantly -- the interpretation of that experience with respect to the average drive; and 3) the compatability of 10% ethanol blended gasoline with materials in, and cleanliness of, the auto fuel system.

With respect to each of the above, the record has been grossly confused by frequent failure to differentiate clearly the effects of methanol and ethanol. Therefore, I emphasize that these comments--and the issue that occasions them -- involve ethanol; the two materials, ethanol and methanol, while sharing a common class name, have markedly differing consequences to fuel behavior. These differences are nowhere more critical than in the area of alcohol's influence on fuel volatility and related engine performance and reliability. Ethanol must be judged solely on the record of ethanol and not on the sometimes more extensive record of experience with methanol.

1. The ASTM volatility standards and the related issue of ethanol's impact.

The ASTM volatility standards are intended to serve industry and consumers as guidelines around which acceptable specifications can be drawn. They are necessarily broadly applicable and represent a compromise between divergent interests. Special situations warrant special adaptation of the guidelines, and the case of 10% ethanol provides a classic example of proper use of latitude in application of the standards. Application of ASTM D439 ("Standard Specification for Automotive Gasoline") to the base gasoline adequately assures a suitable anchor of quality control. The inherent effect of blending

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Replacement parts are being manufactured -- and from the late 1970's have been manufactured -- to be compatable with 10% ethanol. Therefore, those vehicles that may develop compatability problems are a rapidly dwindling part of the auto population -- consisting only of those older cars which in 10 to 15 years have not had critical carburetor and other fuel system parts replaced within their lifetime. To put the materials compatability problem in perspective, two points are noteworthy: 1) component failure or malfunction involve mostly small parts -- failure is not catastrophic; and 2) while 10% ethanol may place a burden upon a small fraction of the older auto population, these are the very units most in need of corrective action to reduce CO emissions. Moreoever, correction is a one-time occurrence in as much as replacement parts will remove the potential for subsequent ethanol incompatability.

Fuel line filter plugging, sometimes misclassified as a materials problem with ethanol, is actually a problem of fuel system deposit instability under the influence of ethanol. Because ethanol has a cleansing characteristic which loosens fuel systems deposits, the deposits are freed to move downstream to accumulate at the point of filtering. The remedy, filter replacement, is simple and can be anticipated. The problem would be non-recurring with either continued or seasonal use of ethanol-blended fuel.

The potential for problems with fuel system corrosion and deposits is inherent in all fuel formulation -- 100% hydrocarbon or blended. While the potential for corrosion is greater with ethanol present in gasoline, the ethanol industry is committed to using available corrosion and deposit inhibitors that are fully adequate to maintain all parts of the fuel system clean and corrosion-free to the point of preventing operational problems. In this respect, properly protected ethanol-blended fuels are in every respect the equal of 100% hydrocarbon fuels. In fact, in this area of consideration, the technical question applicable to any gasoline formulation is not whether ethanol is or is not used, but whether adequate protection is afforded via use of an effective additive package.

ETHANOL'S PUBLIC POLICY BENEFITS

Ethanol has a number of significant air quality and public policy benefits which should be considered:

Lead Phasedown Impact One of the primary reasons the Environmental Protection Agency was convinced that the lead phasedown initiatives would be successful is that octane alternatives, such as ethanol, were readily available to replace the octane value in gasoline that would be lost by removing lead.

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Carbon Monoxide Impact In testimony before the House Subcommittee on Energy and Power on June 17, 1987, Mr. Richard Wilson, director of EPA's Office of Mobile Sources, stated that the use of ethanol blends would reduce motor vehicle emissions of carbon monoxide by approximately 22%. The State of Colorado recently enacted a state regulation requiring the use of oxygenated fuels to reduce the wintertime levels of carbon monoxide along the Colorado Front Range. Use of ethanol-gasoline blends are expected to comprise more than half of the oxygenated fuel in this effort.

Aromatic Content Impact Not only is ethanol an effective octane alternative for lead, it is also a much more environmentally benign substitute that other octane-enhancing alternatives for lead: the refinery addition of benzene, toluene and mixed xylenes in gasoline. The aromatic fraction of gasoline has increased 50% in the last 10 years, and EPA documents state the aromatic fraction is expected to double from pre-lead phasedown levels by the 1990s. If anything, ethanol should be viewed as much as a substitute for aromatic content as it is as a lead substitute. Furthermore, a recent technical report shows that nonbenzene aromatics in gasoline, such as toluene, which is the third-ranking added octane enhancer in gasoline, are precursors to benzene exhaust in the combustion process. Thus, not only does the addition of ethanol proportionately reduce the amount of aromatics in the base gasoline, its presence for octane enhancement purposes can significantly reduce benzene in the exhaust.

Photochemical Reactivity Impact Ethanol has a substantially lower photochemical reactivity than the hydrocarbon emissions produced from gasoline. This means that evaporative emissions containing ethanol will produce less ozone than the same amount of emissions comprised of other hydrocarbons. Studies demonstrate that many aromatic compounds have a particularly high photochemical reactivity.

Reduction of Tailpipe Emissions Impact Numerous tests and studies have documented the fact that tailpipe hydrocarbon emissions are reduced by the use of ethanol blends._

Agricultural Impact The National Advisory Panel on Cost-Effectiveness of Fuel Ethanol Production identifies in their study several public policy and economic benefits associated with production and use of ethanol. Highlights from the report include the following:

1. The single most important factor in determining the future growth and development of the domestic ethanol industry is consistent and reliable public policy. Specifically, the federal government's support for the continuation of current federal exise tax incentive should be left alone and in place to provide consistent development and economic opportunity.

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2. Increased production efficiency in the ethanol industry is likely with new processing innovations that could improve the cost effectiveness of the ethanol industry.

3. Ethanol production provides significan benefits to agricultural economies in terms of higher prices for feed grains, increased farm income and federal budget savings on farm program costs..

4. The use of ethanol blends has been proven to reduce carbon dioxide automobile emissions by 10 - 30%. In CO nonattainment areas ethanol can provide substantial air quality improvements.

5. Increased ethanol production will provide an effective tool to increase long term grain demand which will reduce worldwide over production of grains and is the only permanant solution to the continuing high cost of supporting the farm structure.

6. Ethanol is one of a very few demonstrated commercially available liquid fuel alternatives capable of displacing petroleum (especially petroleum imports) in our highly oil dependent transportation sector.

Congress and the Federal Government should be aware that the 1993 expiration date for the ethanol exise tax exemption seriously prohibits ethanol development and threatens current ethanol industry prodution distribution market infrastructure. Stable, long term, consistent support for ethanol fuel development is necessary if the industry is to continue.

After four months of complete review and evaluation, the National Advisory Panel on Cost-Effectiveness of Ethanol Fuel Production has concluded that domestic ethanol production and use clearly increases farm income, provides a net budget savings to the U.S. Treasury, has become an important element in efforts to improve air quality and represents an effective alternative to rising foreign oil imports.

The report states that ethanol production and use represent cost-effective public policy designed to enhance the use of surplus farm commodities to produce currently scarce transportation fuels. In the process, ethanol production will improve the American farm economy, promote rural economic development, improve the quality of the air we breathe and enhance the performance of our automotive fuels. In a recent Congressional Research Service report, it was estimated that increased production and use of ethanol as an alternative fuel, would decrease farm subsidies by from $3 billion to $7 billion annually.

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The beneficial economic impact of using the nation's surplus corn to make fuel ethanol is also demonstrated by the recently-issued report of the Vice President's Task Force on Alternative Fuels. That report stated that domestically-produced ethanol using corn as a feedstock reduces federal subsidies and costs under the current crop price support programs by 59 cents to $1.37 per gallon of ethanol produced. Using the minimum savings figure to the government of 59 cents -- which is equal to the present value of the interest and storage costs for the amount of surplus corn that would produce one gallon of ethanol -- the revenue losss by the 60-cent per gallon excise tax exemption for ethanol blends is almost entirely offset. If the savings figure is closer to the Vice President's highest estimate of $1.37 per gallon of ethanol, then fuel ethanol reduces costs to the federal government by more than twice the amount that is lost in exise tax revenues.

These facts provide the indisputable answer to the nay-sayers who continue to allege that fuel ethanol production is a drain on the American economy. Even if one assumes that its net cost to the federal government is one cent per gallon, arrived at by subtracting the Vice President's lowest savings figures from the excise tax revenue loss, what we are considering is the cost to the government weighed against the creation of markets for seed corn, markets for fertilizers, markets for farm implements, markets for labor, and economic benefits in all areas where corn becomes a product a farmer can sell for cash on the open market.

Energy Security Impact Transportation is the major bottleneck to reducing America's vulnerability to future oil supply disruption, and transportation accounts for 63% of total U.S. oil consumption. With the United States 97% dependent on oil as a mobility fuel, ethanol production and use provides a quality liquid fuel which can help meet our nation's need for domestic mobility fuel.

Ethanol is a proven, finished octane booster ready for blending with gasoline, and capable of significantly reducing crude oil imports. In fact, in 1986, domestic ethanol production reduced crude oil imports by 1 billion gallons.

Ethanol is a liquid fuel at a time when our dependence on imported liquid fuels represents our greatest energy vulnerability. Ethanol can be easily assimilated into the existing supply and marketing systems as an octane booster or as an extender with gasoline.

The U.S. is now importing 42% of its energy needs, resulting from a 22% increase in oil imports during the past 12 months. This is a sharp rise in oil imports, from 4.9 million barrels per day to 6 million barrels per day, leaving the U.S. more dependent on imports than at any other time since 1980. Some petroleum industry sources feel that if this trend continues, the U.S. could rely on crude oil imports to meet over 50% of U.S. oil demand in less than four years.

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METHANOL AND ALTERNATIVE FUELS PROMOTION ACT OF 1987

The Renewable Fuels Association is honored to enthusiastically endorse Senator Rockefeller's "Methanol and Alternative Fuels Promotion Act of 1987." We believe S. 1518 will enhance our ability to find new solutions to our environmental, national energy security and economic development challenges. It will provide the necessary incentives for U.S. automakers to manufacture vehicles capable of operating on neat or nearly neat alcohol fuels. General Motors, Ford and other automakers have produced millions of automobiles over the past eight years in Brazil designed to run on 100% ethanol. Major auto manufacturing companies have perfected alcohol fuel vehicles and sell these exceptionally high quality -high performance automobiles to highly satisfied consumers in Brazil today.

The Rockefeller bill will provide American consumers with an opportunity to purchase an automobile designed to operate on clean burning alcohol fuels. Ethanol has proven that it is a valuable fuel in the U.S. for use in automobiles, which account for over 60% of American oil consumption. It burns more efficiently in automobiles than gasoline, providing almost identical fuel economy with one-third less energy, it increases the octane of gasoline in a 10% blend by three points. Ethanol burns cleaner than gasoline, reducing carbon dioxide exhaust by up to 25%, and perhaps most importantly, ethanol is produced domestically from raw materials that are abundant and readily available.

For the past seven years, the domestic ethanol industry has grown steadily from zero production to over 1 billion gallons of production capacity today. Despite this phenomonal record of devolopment, the domestic ethanol industry has been hampered by efforts to eliminate government incentives designed to encorage the marketing of ethanol prodution from renewable resources.

The domestic ethanol industry was established during a time of serious concern over the availability of energy supplies and has developed into one of the nation's leading octane enhancing additives available on the market today.

Initiatives such as the Rockefeller bill will provide increased attention and support for the further development of the alternative fuel industry in the U.S. Using surplus American grain to produce ethanol and abundant coal and other resources to produce methanol will foster economic development, enhance energy security, improve the quality of the environment, and provide American motorists with clean, safe fuels capable of delivering high levels of performance.

Thank you.

Senator ROCKEFELLER. Mr. Ditlow.

Mr. DITLOW. Senator Rockefeller, thank you.

CAFE standards are the single most effective energy conservation program in this country, with improved vehicle fuel economy since 1975 reducing gasoline use this year by 2.35 million barrels per day. For that reason, a coalition of 14 environmental, energy conservation and consumers groups opposed the companion bill in the House, H.R. 3399, which would seriously weaken CAFE standards while not increasing methanol use. We believe that the cap that is in S. 1518 would provide an adequate protection for the CAFE standards, although our initial proposal was no cap.

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But past experience experience with electric vehicles and diesels demonstrate CAFE credits alone will not encourage use of alternate fuels or power plants. Although the fuel economy law provides for higher CAFE for electric vehicles, this never spurred production of any EVs. Although GM introduced higher mileage diesels to obtain CAFE credits, they were so unacceptable to consumers that GM dropped them in 1985, even though GM missed the 1985 CAFE standard by 1.7 miles per gallon at a cost of over $300 million in CAFE penalties.

When the auto companies can meet CAFE standards, S. 1518 creates no real incentive for car companies to produce dual-fuel vehicles. Average 1987 new car fuel economy was 28.2 miles per gallon versus the 26 mile per gallon CAFE standard. All three domestic manufacturers beat the 1987 standard, with Chrysler at 27.9, Ford, 27.1 and GM, 26.7. They will do even better in 1988 as they phase out less fuel efficient models, and all car companies will surpass the 27.5 mile per gallon statutory CAFE standard by 1990.

To give meaning to methanol CAFE credits, the CAFE standard itself must exceed 27.5 miles per gallon.

The single most effective provision in S. 1518, as I pointed out earlier, is the cap on CAFE credits. But even the 1.5 mile per gallon cap will increase gasoline use by 200,000 barrels per day if used to reduce CAFE from 27.5 to 26.0. Without a cap, CAFE credits for dual-fuel vehicles would more than offset energy conservation gains from CAFE standards in the future.

Consumers will not use methanol in dual-fuel vehicles unless it offers equivalent performance to gasoline, just as with electric vehicles, the biggest drawback is driving range, and unless dual-fuel vehicles have larger gas tanks or they are optimized, as EPA said could be done, they will only have 55 percent of the range on gasoline and must be filled twice as often.

A 1987 Dodge Diplomat with a 333 mile driving range on gasoline gets only 183 miles on methanol, or only 90 miles out and 90 miles back from a methanol station. And even if methanol fuel stations are readily found, consumers are inconvenienced by more frequent fill-ups and will opt for gasoline's longer range.

But given the difficulty in developing the support system itself necessary to deliver methanol to the automobile fleet, the Center believes a better way to ensure the real advancement of neat methanol and CNG use is in fleets such as large commercial fleets, Federal fleets and mass transit buses. Such fleets are of sufficient size to result in significant methanol use and to develop refuelling stations for wider use for the public at large. In fact, the Center for Auto Safety and NRDC recently settled a lawsuit against EPA and GM by getting GM to fund a $7 million methanol bus demonstration program in New York City.

And I would like to point out that some of the testimony of General Motors about its methanol bus program is directly from the Center for Auto Safety/NRDC settlement with GM.

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In advancing neat methanol and ethanol blends, care should be taken not to extend the program to lower percentage blends which do not offer the benefits of neat blends. Low percentage blends do not permit vehicles to be optimized for better performance, and such blends have higher volatilities, which increase evaporative emissions. In short, our concern about S. 1518 is not that it does not have a good goal, but we are afraid that it does not have the horsepower to get us where we need to go, which is the actual use of methanol in vehicles.

Thank you.

[The statement follows:]

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STATEMENT OF CLARANCE M. DITLOW III, DIRECTOR, CENTER FOR AUTO SAFETY

Mr. Chairman and members of the Committee, thank you for the invitation to testify on S. 1518 which is intended to stimulate the development of methanol and other alternative fuels. The Center for Auto Safety is a non-profit organization that works primarily on consumer issues pertaining to motor vehicles including fuel economy, safety, emissions and fuel quality. The Center has played a leading role in the development of strong CAFE standards under the Energy Policy and Conservation Act of 1975 (EPCA).

Development of methanol and alternative fuels must be an integrated part of an overall program to reduce dependence on and consumption of gasoline. The most important part of such a program is strong fuel economy standards which will not only reduce gasoline use but also will create an incentive for car companies to produce vehicles that use methanol. For that reason, a coalition of 14 environmental, energy conservation and consumer groups opposed H.R. 3399 which would seriously weaken fuel economy standards while not increasing methanol use. CAFE standards are the single most effective energy conservation program in this country with improved vehicle fuel economy from 1975 levels reducing gasoline use in 1987 by 2.35 million barrels/day.

CAFE CREDITS ALONE WILL NOT ADVANCE METHANOL USE

Past experience with electric vehicles and diesels demonstrates CAFE credits alone will not encourage the use of alternative fuels or power plants. Although EPCA was amended to provide a mechanism to give higher CAFE for electric vehicles, the mechanism never spurred production of any electric vehicles. Although GM introduced higher mileage diesels in cars to obtain CAFE credits, they were so unacceptable to consumers that GM dropped them in 1985 even though the auto maker missed the CAFE standard by 1.7 MPG at a cost of over $300 million in CAFE penalties that year.

CAFE CREDITS WITHOUT STRONG STANDARDS ARE NOT A METHANOL INCENTIVE

Since the auto companies can meet CAFE standards, S. 1518 creates no real incentive for car companies to produce "higher fuel economy" vehicles that run on methanol. Average 1987 new car fuel economy was 28.2 MPG compared to the CAFE standard of 26.0 MPG. All three domestic manufacturers beat the 1987 CAFE standard with Chrysler getting 27.9 MPG, Ford 27.1, and GM 26.7 after EPA CAFE adjustment. The auto makers will do even better in 1988 as they phase out less fuel efficient, older technology cars. All the car companies will surpass the 27.5 MPG statutory CAFE standard by 1990 unless they export production of small cars at the expense of jobs in America. To give meaning to methanol CAFE credits, the CAFE standard must be raised beyond 27.5 MPG.

Assuming CAFE standards are increased to conserve energy, it is essential that any CAFE credits be capped no higher than the caps proposed in S. 1518. Even the 1.5 MPG cap in S. 1518 will increase gasoline consumption by 200,000 bbl/day if used to reduce CAFE from 27.5 to 26.0 MPG. Without a cap, CAFE credits for dual fuel vehicles could completely offset energy conservation gains from CAFE standards. An example is shown in the following table which recalculates Ford's 1986 CAFE assuming just its large/intermediate rear wheel drive cars were converted to dual fuel. Ford's CAFE would increase by 8.5 MPG to 34.9 MPG.

S. 1518 wisely limits full CAFE credits to dedicated methanol and alternative fuel vehicles. The bill provides reduced CAFE credits for dual fuel vehicles *capable of* running on methanol without regard to whether they actually run on methanol. In the worst case, CAFE standards would be lowered while alternative fuels would not be developed. Auto companies could produce cars with optical sensors in the fuel system which will permit the car to run on either gasoline or an 85% methanol blend. Even if the car never uses a gallon of methanol, the manufacturer would get the inflated fuel economy for the vehicle.

FORD'S 1986 CAFE WITH METHANOL

	Ford's Apr. 19, 1985, projection		Dual fuel projection (fuel economy)
	Fuel economy	MIX (percent)	
Car line:			
Escort/Lynx/Exp	34.0	19.6	34.0

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FORD'S 1986 CAFE WITH METHANOL—Continued

	Ford's Apr. 19, 1985, projection		Dual fuel projection (fuel economy)
	Fuel economy	MIX (percent)	
Tempo/Topaz	30.6	13.5	30.6
Mustang/Capri	24.1	8.6	24.1
LTD/Marquis	23.8	4.8	59.6
Taurus/Sable	25.8	20.1	25.8
T Bird/Cougar	24.1	13.4	60.4
Ford/Mercury	21.6	13.4	54.2
Continental	21.7	4.9	54.2
Mark	20.9	.7	52.1
Town Car	21.5	4.9	53.8
Total		100.0	
Unadjusted fleet CAFE		26.0	34.5
Adjustment summary:			
Additional test vehicles		.2	.2
EPA CAFE adjustment		.2	.2
Adjusted CAFE (miles per gallon)		26.4	34.9

In order to advance methanol use in dual fuel vehicles, the inflated fuel economy should be linked to the use of methanol or other alternative fuel. First CAFE credits could be tied to actual methanol use as is done with dedicated fuel vehicles. Other ways to ensure actual methanol use would be to sunset the credit if significant amounts of 85% methanol blends are not used; limit the credit the first year with increases in subsequent years geared to match actual increases in methanol use; and setting criteria for optimizing the methanol capable vehicles such as limiting the credit to vehicles certified by EPA on premium unleaded fuels.

CONSUMERS WON'T USE METHANOL IN MARGINAL DUAL FUEL VEHICLES

Consumers will not willingly use methanol in dual fuel vehicles unless it offers equivalent performance to gasoline. Just as with electric vehicles, the biggest drawback is driving range as S. 1518 recognizes. Unless dual fuel vehicles have larger gas tanks, they will have only 55% of the range on gasoline and have to be filled almost twice as often. The 250 mile driving range in S. 1518 is an acceptable minimum if based on the EPA label and fuel economy guide.

For a 1987 Dodge Diplomat with a 333 mile range on gasoline, this means a 183 mile range on methanol. For a consumer operating from a fixed methanol fuel station, this permits driving only 90 miles from that base. If you have a Yugo, the maximum range on methanol is only 143 miles or scarcely 70 miles from home. Even if methanol fuel stations are readily found, there is considerable consumer inconvenience in more frequent fillups. What consumer driving back from the shore in bumper-to-bumper traffic wants to make an extra fuel stop. Low-range 1987 cars include:

	Gasoline range	Methanol range
Model:		
Yugo	259	143
Acura Legend	297	163
Dodge Diplomat	333	183
Chrysler 5th Avenue	333	183
Plymouth Grand Fury	333	183
Pontiac Firebird	333	183
Chrysler New Yorker	343	189
Dodge 600	343	189
Toyota Corolla FX-16	356	196
Chevrolet Camaro	357	196
Pontiac Fiero	357	196

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GREENHOUSE EFFECT MUST BE CONSIDERED IN SUPPORTING ALTERNATIVE FUELS

S. 1518 should be amended to require more consideration of resultant carbon dioxide (CO_2) emissions into the atmosphere from the various alternative fuels under consideration. According to a recent analysis by the World Resources Institute, there can be a three-fold difference in CO_2 emissions depending upon the source of and alternative fuel used in motor vehicles. As shown in the following table, compressed natural gas (CNG) is the lowest and methanol from coal is the highest in carbon dioxide production.

Vehicle fuel:	*Percent* [1]
CNG	77
Gasoline	100
Methanol from natural gas	112
Methanol from coal	191–235

[1] Percent carbon dioxide relative to gasoline.

There are a number of other alternative fuels and power plants which also should be evaluated and considered in such Federal studies. As demonstrated by GM's accomplishment in winning the cross-Australia race with the solar powered Sunraycer, there have been significant advances in alternatives not covered by S. 1518. Other alternatives that should be evaluated include electric vehicles, hydrogen power, and high temperature ceramic engines.

FLEET USE IS THE BEST WAY TO DEVELOP METHANOL AND CNG

Given the difficulty in developing the support system necessary to deliver methanol to the private passenger automobile fleet, a better way to advance neat methanol and CNG use is in fleets such as large commercial fleets, the Federal vehicle fleet and in mass transit buses. Such fleet insures a controlled demonstration of sufficient size to encourage significant methanol use and to develop refueling stations for wider use.

Mass transit buses with diesel engines which have high levels of harmful emissions including carcinogens are particularly good users of alternative fuels. Substitution of methanol fueled buses with catalysts to eliminate aldehydes in the exhaust would significantly reduce air pollution in urban areas. To demonstrate the feasibility of methanol use, the Center for Auto Safety and the Natural Resources Defense Council recently settled a lawsuit against EPA and GM in which GM agreed to fund a $7 million methanol bus program in New York City.

In advancing neat methanol and ethanol blends, care should be taken not to extend the program to lower percentage blends which do not offer the benefits of 85% and higher blends. Lower percentage blends do not permit vehicles to be optimized to deliver better fuel economy. Such blends also have much higher volatility levels which increase evaporative hydrocarbon emissions and ozone levels as well as posing a fire hazard.

Senator ROCKEFELLER. Thank you very much, Mr. Ditlow.

Maybe I should just start, Mr. Ditlow, with you.

Do you support the development of methanol vehicles, those vehicles that can run on high concentrations of methanol fuel or other alternative fuels, for that matter?

Mr. DITLOW. The Center itself does.

Senator ROCKEFELLER. All right. Do you think that there is such a thing, in fact, as the chicken and egg problem with the development of those alternative fuel vehicles? In other words, do you think that it is plausible that fuel suppliers would not make the investment in methanol fuelling facilities without cars on the road?

Mr. DITLOW. We do, and that is why we favor the fleet programs which will have the refuelling stations associated with them.

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One of the essential elements of our settlement in the New York City case is that Celanese developed a refuelling station, and we wanted to open that up to the public for other use. Celanese did not like that idea.

Senator ROCKEFELLER. Then I take it you would also feel that auto makers would be reluctant to build cars without a refuelling possibility or fuelling possibility out there in some form.

Mr. DITLOW. Oh, we certainly agree with that, sir.

Senator ROCKEFELLER. Well, you have said that you have a letter attached to your testimony which expresses opposition to S. 1518 of 13——

Mr. DITLOW. No, to the companion H.R. 3399, which does not have a cap.

Senator ROCKEFELLER. Well, then, all right, you are saying it does not express the opposition to S. 1518?

Mr. DITLOW. Oh, no, no, it does not express opposition to S. 1518. We think that, as I stated, S. 1518 has the essential provision that protects the energy conservation gains, which is the 1.5 mile per gallon cap. It is the lack of the cap in the House bill that causes us to oppose the House bill.

Senator ROCKEFELLER. Good.

Senator MCCAIN. May I interrupt, Mr. Chairman?

Senator ROCKEFELLER. Of course.

Senator MCCAIN. Does that mean that you are in support of S. 1518?

Mr. DITLOW. We would go further than what S. 1518 does. We would go into mandating fleet use of methanol, neat methanol fuels.

Senator MCCAIN. I understand you would go further, Mr. Ditlow. Does that mean you are in support or nonsupport? Is that too tough a question?

Mr. DITLOW. No, Senator, that is not.

It is like any bill. We think that the—we worked on the compromise version of S. 1518, and as a compromise we would support it. We think that it is not going to get the job done because it is not going to get the methanol in the cars.

Senator MCCAIN. Thank you.

Thank you, MR. Chairman.

Senator ROCKEFELLER. Mr. Ditlow, I do not imagine that automobile companies or all people that work for all automobile companies are thrilled about some of the basic fuel economy laws on the books. Nevertheless they are there, and I want to make it very, very clear to you and anybody else that I very much support those, and in fact, I have tried, as you know, very hard to tailor my bill to fit those requirements and those caps.

It has not been easy, I might say, over the last several years in dealing with automobile companies to try to tailor a bill which can work and yet which basically respects the CAFE laws of our society.

Mr. DITLOW. Senator Rockefeller, you and your staff have put an enormous amount of time and effort into it, and you have come up with a very good compromise bill that takes into consideration the need for the caps.

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Senator ROCKEFELLER. I just want to make a couple of these points to you. We have included mileage per gallon caps. Those are in the bill. I have included vehicle production caps. I have included language which addresses some of the driveability concerns that you mention that consumers might be concerned about with respect to new alternative fuel vehicles. I have included a much reduced cap in the circumstances where any one auto maker seeks regulatory relief from CAFE regulations at NTSA. This is so even when it is another auto maker who has sought the relief, I have included a driving range requirement of 250 miles. That may not be adequate from your point of view, but nevertheless, it can only be altered by the Secretary of Transportation if there are certain developmental and technology problems, and then only to 200 miles, which is not bad. I mean, 250 miles is sort of an average commuting week for a lot of people.

And I have included labeling requirements, and I have included study requirements.

In short, in all fairness, I just want to spread this on the record, I think that I have addressed virtually every concern that was leveled at the old bill S. 1097 bill. We have really made an effort to do that, and I do not think frankly that there is a whole lot of wiggle room with respect to altering the bill. There will be some alterations that will be made, but I think the balance is there so it it can both be passed and it can still reflect proper laws that are now on the books and not do violation to them. It can break the chicken and egg cycle, hold out hope for the consumer, and hold out hope for jobs for people in farmlands and coal areas, a fairly delicate balance.

Now, that is not a question, unfortunately. That was just a statement.

Let me ask you a question that I asked the automobile companies. For the companies to exceed the caps placed in this bill, GM has got to produce 440,000 of these flexible fuel vehicles, Ford is around 200,000, and Chrysler is in excess of 120,000.

Do you think, Mr. Ditlow, that they would want to put in excess of 10 percent of their fleet right off the bat in this basket representing probably billions of dollars of investment, or do you think that they would probably want to test the market, be somewhat more cautious, and edge into their decision more carefully?

Mr. DITLOW. If CAFE standards were increased in the future, I believe they would exceed the 10 percent margin by far. I think that they would——

Senator ROCKEFELLER. If there were no——

Mr. DITLOW. If CAFE standards were increased to 30 or 35 by a future administration, then I believe that they would exceed the 10 percent. The CAFE standards stand at 27.5, I do not believe that they will go above 10 percent because I do not believe they need the CAFE credits.

Senator ROCKEFELLER. Okay.

Mr. DITLOW. Senator Rockefeller, the way that we look at the 1.5 mile per gallon cap is that it is a failsafe mechanism. In other words, if they are going to do less than 10 percent, then the cap imposes no con-

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straint, but if they were going to do more than 10 percent, to use a loophole in the CAFE standards, then we need the cap for that protection.

If in fact, and we did in negotiations earlier on, we suggested that there could be a higher cap if we actually had methanol use, and one of the things I would like to make absolutely clear is if you are getting the methanol use, then let's go back and revisit the entire scenario and the entire piece of legislation.

Senator ROCKEFELLER. Okay.

Mr. Ditlow, am I right or perhaps wrong that the chart included in your testimony does not purport to reflect the formula used to calculate the fuel economy of the dual-fuel vehicle in S. 1518? I cannot figure out how you do your calculation.

My staff did calculations which came out differently from yours.

Is this something we need to get together on?

Mr. DITLOW. I would be glad to get together with your staff on that. We followed the formula, averaged the two fuels and then harmonically weighed the result, but I would be glad to sit down with the staff to see if there is any difference.

Senator ROCKEFELLER. Okay.

I have already gone over five minutes.

Senator McCain, do you want to ask some questions; then I will continue.

Senator MCCAIN. Thank you, Mr. Chairman.

Mr. Noteware, I certainly was impressed, although I have seen the numbers before, that California is the third largest consumer of gasoline in the world. That is a very impressive figure, and I have more than a passing interest since so many of my fellow Arizonans travel to San Diego in the summer, and they use a lot of that gasoline.

The question that I would have for you, sir, is particularly in a state like California, how difficult do you think realistically it would be to set up distribution systems for alternative fuels?

Mr. NOTEWARE. I think Mike Jackson might be in a better position. He has been working with this. He is in a better position to answer.

Mr. JACKSON. Currently now in California we have like 20 retail stations that are distributing methanol. The difficulty itself in terms of what equipment is required to use methanol is not that much different than current petroleum products. We do have certain requirements in terms of the corrosivity of methanol compared to gasoline or diesel, so you have to change some of the materials in your distribution system.

A lot of the existing systems can be used. We have retrofitted some of our stations in California using existing underground tanks. Steel underground tanks are fine. We do have some problems with fiberglas underground tanks. They have to have the right resin to be used.

A concern to us would be more on bulk storage and distribution as opposed to the retail. We think that the retail stations will come along, and that will not be much of a problem. The question is how do we get methanol to California cheaply.

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Right now we are paying a premium to transport methanol to California. With bulk shipments in dedicated tankers, we can reduce those costs considerably.

Senator McCain. So you are not in agreement with one of the previous witnesses who stated that the cost of methanol would just continue to go up?

Mr. Jackson. Our analysis does not indicate that—our analysis indicates that methanol will continue to go up. The current price of methanol now we believe is competitive with gasoline. You can land methanol in California for prices that range from 18 to 36 cents a gallon.

Now, in the future, as we bring on, as you use up the overcapacity and bring on new plants, the price will go up. The long term price projection that we see is around 42 cents a gallon, producing methanol from natural gas. We believe that that, in the long term, will also be competitive with gasoline.

Senator McCain. Do you think that my somewhat idealistic statement about educating people in our states that the use of methanol is very beneficial to their health and to their futures is a factor here? Do you think that——

Mr. Jackson. We think it is a factor. We think that you can market methanol not only based on its performance characteristics, such as octane, a higher octane, but also on its clean air benefits. Studies that we have done in California have indicated, surveys, that people are willing to pay a little bit more for cleaner air.

We do have a problem, and it is a near term problem in California. We need some solution to get over some of these nonattainment areas. Methanol offers a broad, integrated solution that, combined with all the other techniques that we need to do such as lower emission gasoline vehicles, such as improved I&M, such as ride sharing, all those things are important. Methanol offers yet another step in that solution.

Senator McCain. A very significant one?

Mr. Jackson. Yes, in our estimation.

Senator McCain. Thank you.

Mr. Ditlow, do you think it is fair to compare the failure of CAFE credits in regards to electric automobile, electric car technology with that of methanol, given the fact that electric car technology, when those credits were installed, I think in the opinion of most everyone, was certainly not at a stage where we could in the foreseeable future see a mass produced electric automobile?

Mr. Ditlow. I certainly think that it is a good analogy or I would not have made it, Senator McCain.

The way that I perceive it is you do not have the support system out there to deliver methanol to the vehicles, and you do not have an optimized methanol vehicle. And I perceive that in terms of the goals of the act, to get actual methanol use, to get actual electric vehicle use, I do not think the CAFE standard incentive is enough to get the methanol into the cars and used by the consumers.

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I mean, I think the other analogy, the diesel one, is really a lot closer because the diesel, according to GM, failed because of the increased price of diesel fuel and the decrease in gasoline. We think the fact that the cars were a little bit of a lemon, and in fact, they were a bad car, had another role to play with it for the consumers, but the bottom line is that the CAFE credits alone do not ensure that you get the type of fuel or power plant that you want. You need to go beyond it.

Senator McCAIN. But I think Mr. Baly might make a case that CAFE credits are very important, at least at this point.

Would you agree with that, Mr. Baly?

Mr. BALY. I certainly would, Senator, if we are going to meet the kinds of goals that you and Chairman Rockefeller want to seek. We look at our neighbor to the north, Canada. They have come up with a proposal to convert at least half a million vehicles just to natural gas alone, let alone methanol and propane.

One suggestion that I have, when you go to conference, is to look at the House demonstration program there as well as a proposal that would look at the methanol infrastructure. As I recall, most of the methanol produced from natural gas today is for the chemical industry. There is some concern that you will not have the infrastructure available for the kinds of needs under the Rockefeller bill, at which point the U.S. would start to import methanol.

The House bill just suggests that you look at trying to develop an infrastructure through the distribution and pipeline system where they could actually convert to natural gas to methanol, particularly until there is movement toward the coal methanol program. But at least now it is all done at the producer end, at the refinery level, and so we hope that you would look carefully at that study proposal.

But as I mentioned in my testimony, we feel in order to urge and push the manufacturers along, that the kinds of incentives that are in the Rockefeller bill is one of the things we need to get moving in this country.

Senator McCAIN. Thank you.

Thank you, Mr. Chairman. Thank you for having this hearing on this very important legislation.

Senator ROCKEFELLER. Thank you, Senator McCain.

Mr. Vaughn, it is interesting, although I have only been here two and a half years, there has been some history of contention between methanol and ethanol. We are trying to stop that. Tom Daschle and I are good friends. At an early meeting we decided that methanol and ethanol were going to work together in pursuit of mutually good positions, and if we have to battle at some later time over tax incentives or whatever else, then so be it. The point is, as one gets moving, the other gets moving, and we all get moving.

Do you in fact think—how do you look at that yourself? The idea is methanol, as we are talking about it, a methanol bill, so to speak, but actually it is also ethanol. How does reliance on one help the other? In fact, do you see a day when methanol and ethanol could be co-mixed? How do you see the relationship between the two?

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Mr. VAUGHN. Senator, I think your question in your opening statement is right on target. There have been a number of times over the past several years where the two industries have battled it out in public and in private. But the facts are that the wisdom of the people of South Dakota and the wisdom of the people of West Virginia brought to the Senate two very bright, capable people who finally decided that talking was an awful lot better than shouting at one another.

We see your initiative as principally a methanol initiative. We do not have any designs, nor do we believe that ethanol can compete as a neat fuel in the United States. It does in Brazil because of some very heavy subsidies and long term decisions regarding energy policy and industrial development. With the current marketing incentive in the United States, ethanol is within 10, 15 cents of methanol's price. So today, ethanol is capable of competing as a neat fuel, but that subsidy is slated to expire, and once it does, we will be, we hope, finally in a situation where we will be competing directly with other octane boosters, which is where we should be competing with in the first place.

I see the alcohol fuel future in the U.S. evolving to include an expansion of the 10 percent ethanol blends in the market Ethanol blend expansion will come first in the corn belt, in the northern midwest, the 18 grain states principally and as we see the expansion and use of methanol as a neat fuel, I would predict in the near term, probably the next five, ten years, depending on the pace of the methanol industry growth, a blend of ethanol and methanol. Fifty-fifty would be terrific, more likely 60-40, 70-30 of methanol-ethanol.

Ethanol is an excellent co-solvent to be blended with methanol. It improves its performances properties, its ability to lower the corrosivity of the fuel itself, lowers its water tolerance, and helps overall in the blend, and plus, expands its Btu content for energy output.

So I would see a blended product coming in to play in neat fuels, in neat vehicles, starting first with the fixed fleets, then expanding beyond that.

Senator ROCKEFELLER. I think philosophically, ethanol, methanol, natural gas, we have to talk about all of them together to try to make the coalition as large as possible. You know, as Mike Baly knows, the State of West Virginia has in fact a lot of natural gas, but it is not necessarily as retrievable for these purposes, let's say, as reinjected gas in Alaska or flared gas in other places.

Nevertheless, I think one has to be realistic. When I am talking to coal miners, they understand that natural gas is going to be the first beneficiary of any progress on methanol because it is easier to get to and it is cheaper and that is what is going to happen. But coal is going to find its place. Coal is going to have its time. And in fact, with almost 500 billion tons of coal available in this country, it is inevitable that the whole thing sort of ends up and moves inevitably towards coal with the resulting jobs.

But it seems to me that if one looks at just coal or just natural gas or just ethanol, then all parts are held back and nothing happens.

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Mr. VAUGHN. Senator, we have more than enough opponents out there who are looking for any reason, any number of excuses not to see the expansion of alternative fuels. And quite frankly, our opponents have good arguments. Oil is plentiful, the prices, the Saudis are willing to peg the price at somewhere around $18 a barrel, maybe a little lower, maybe a little higher. And the oil industry is not going to move in a direction of promoting alternative fuels, good policy or not; positive impacts for farmers or coal miners, the natural gas industry aside, that is not in their immediate interest. The oil industry in this country, the major 18 oil companies blend less than 3 percent of the ethanol sold in America today.

You have to ask the question, well, why would you not blend it? Why would you attack it in media advertising? Why have they vilified methanol? For one simple reason. For the most part, they do not control the production of alcohol fuels and it is not in their near term, economic interest, to produce and sell such a fuel.

From a driveability standpoint, an environmental standpoint, and maybe most frustrating of all, from an energy security standpoint, and you are one of the few people in this Congress that is standing up and saying what we all need to hear, which is that the energy crisis is with us today and it is not something we can forget about. We are going to read about it on the front pages again and again and again. It is not going away. It is going to take sound public policy, committed public policy, and your legislation moves us forward.

And again, we are very enthusiastic supporters of what you are attempting to do, and we think moving methanol forward will move ethanol forward as it will move natural gas forward as alternative fuels that will help and benefit our economy, our environment, and our energy security posture.

Mr. BALY. Senator, we believe that coal and gas, which are our two largest domestic fuels, should be used together. You have worked so hard, you and Senator Byrd, for coal that gas now ranks third in our country's energy mix. It has dropped over 10 percent the last ten years.

Our van at AGA runs on natural gas, we are working to run that on gas made from coal, and we believe that just as you helped work a compromise on the Fuel Use Act to benefit both the coal and the gas industry, we hope that those kinds of coal gassification technologies, whether it be clean coal or coal gas in our van, that they must be used together.

Senator ROCKEFELLER. Thank you, Mr. Baly, very much.

Let me just ask one final question, Commissioner, of you or Mike Jackson.

The California legislature began looking at this whole question of use of methanol because of nonattainment imperatives in California, and at the same time Japan has been looking at this. In fact, neither I nor any members of my staff have ever been to a meeting on the subject of methanol or anything else where there have not been representatives of Japanese automobile companies, so that they are very much a player in this, or potentially so.

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Now, it has been said that you cannot break the chicken and egg cycle, but on the other hand, you also told us in your testimony that Arco and Chevron are putting out distribution at a certain level and may go up to, I think you mentioned 2000, a level of maybe 2000 stations.

Did you say that?

Mr. NOTEWARE. No. If I did, I did not mean it. We are only talking about 50 additional stations.

Senator ROCKEFELLER. But I thought you indicated that it was going to go up substantially.

It does not make any difference. They are doing it.

Mr. NOTEWARE. They are doing it, yes.

Senator ROCKEFELLER. What was the process which got them to do that? I mean, the theory is that they should not be doing it until the cars are on the road, until the consumers said, look, we want this stuff, where can we find the fuel?

You are saying otherwise. How did that happen?

Mr. NOTEWARE. Well, it might be what you would call a public/private partnership agreement that the California Energy Commission worked out with both Arco and Chevron. We are actually a team player with them in that they provide the fuel pumps at the location, we provide the methanol to get it there, we are using part of that $2 1/2 million that I mentioned from the PVEA funds to help us co-fund the project.

It is really a team effort. It is a partnership with them to get them started. I doubt that they would have had the incentive without this.

Senator ROCKEFELLER. Mr. Jackson?

Mr. JACKSON. Just to add a little bit to that, it is the realization on their part that there is some future to this fuel, that they believe that methanol does make some sense for a variety of reasons, including air quality.

Senator ROCKEFELLER. Well, Mr. Baly just said, or I guess Mr. Vaughn just said that the oil companies are not going to get into this business, it is not in their interest.

I thought Arco and Chevron were oil companies.

Mr. NOTEWARE. Again, they needed the incentive.

Arco might be a little different in that Arco has a chemical company that is capable of producing methanol, although at the present time the methanol that they are going to be selling at these stations will not come from the Arco Chemical Company necessarily.

Senator ROCKEFELLER. Is it not a fact, Mr. Vaughn or anybody else, that like with CO_2 or the spill-off from methanol, from coal or whatever, that there may in fact be uses although the technology is not very advanced at this point, but there are uses that these can be put to. For example, chemical companies can use some of these by-products. Because something potentially has a problem does not mean that technology cannot, as the incentive grows, as demand grows and the momentum grows and everybody understands this is the way the future is going, and therefore they have put their money into research and development, that some of these problems can in fact get worked out.

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Mr. VAUGHN. In fact, some of the by-products you just mentioned are imported into the United States and used in the form of fertilizer, and we import them, surprisingly enough, from Japan.

So yes, there are very significant, very valuable markets for the products you are referring to.

Today the oil companies in many cases operate in one form or another their own chemical companies. The Arco Chemical Company is a major manufacturer of something called MTBE. MTBE is a very effective, very efficient octane booster competing directly with ethanol and methanol, but they produce it at an incredible expense. It is a very expensive process, an extremely expensive operation to maintain and build, and yet that is the signal the oil company is giving themselves, that we must invest in these very high cost, high impact industries from our own chemical companies to produce the fuels that America needs for the future, when ethanol and methanol and natural gas can be those fuels, either in blends or in neat form.

We think they will move, but it is going to take, as is being said by the California Energy Commission, time and incentives such as that included in legislation like yours and others.

I might make one other point, Senator, that there is a concern on our industry's part, and I think I have heard it from others here this morning, that where is this methanol going to come from? I have heard you speak before a number of audiences, and I understand what you are saying when the coal miners understand the process, that we will be looking at imports first, and natural gas second and coal third.

I do not know how it can be done, but I have seen and met with people like Rich Trumka and others. The potential is spectacular. We have the resource, we are the Saudi Arabia of coal, as many politicians have said. To find a way to use that coal in a clean-burning automotive transportation fuel, our most vulnerable sector, could be and should be the highest priority. I do not know what kind of legislative package, and I am not suggesting that you encumber this bill with that, but our industry would be in support of an initiative introduced by you or others in the future to try to find a way to create the incentives to use our coal, our resources to produce such a valuable automotive fuel, transportation fuel.

Mr. BALY. Mr. Chairman, I believe one good example to substantiate your statement is the North Dakota high Btu coal gasification plant. The last time I checked, they were pretty much using or selling most of the by-products from that plant.

Senator ROCKEFELLER. I just want to put a couple of letters in the record here for a moment. From the California Energy Commissioner, Charles Embreck, Chairman, a letter to me on August 4; a letter from the South Coast Air Quality Management District, El Monte, California to me on September 22, from Norton Youngglove; from the Oxygenated Fuels Association, George Dominguez, Executive Director, October 7, a letter to me; a letter from you, Eric Vaughn, to me on August 6, 1987, from the Renewable Fuels Association; a letter to me from you, Mike Baly, from the American Gas Association, July 16,

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1987. This is somewhat obnoxious, but a Washington Post article written by Phil Sharp and Jay Rockefeller, I want that included by reference. Also by reference, the Los Angeles Times, August 24, 1986, an editorial called "Smog Smugness." Los Angeles Times, May 28, 1987, an editorial called "The Path to Clean Air." And May 23, 1987, the Denver Post, "California on Road to Replacing Gasoline with Methanol," that article, and also a letter from Phil Sharp and Ron Wyden to their colleagues on October 19, 1987 with respect to a letter they had received from Mr. Ditlow, from the Center for Auto Safety.

I wanted to put those in the record.

I'd like to particularly thank all five of you gentlemen for being here.

I mean, this is a large subject. This will not be an easy subject. There are a lot of cosponsors to this. It is moving fairly well in the House, but there are some critical differences there. It will be delicate. We have been through the easy part; the hard part will come. But I think it has to happen, and all of you are critical in making it happen and making it happen properly.

I thank you very much, and the hearing is adjourned.

[Whereupon, at 12:27 p.m., the hearing was adjourned.]

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ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

U.S. HOUSE OF REPRESENTATIVES,
Washington, DC 20515, October 19, 1987.

Dear Colleague:

A recent letter from the Center for Auto Safety criticized H.R. 3399, a bill we recently sponsored to promote the use of alternative fuels in automobiles. The criticism was that it contained a "loophole large enough to create a fleet of gas guzzlers."

As strong supporters of the Corporate Average Fuel Efficiency (CAFE) standards, we assure you that the bill does no such thing and we would not support any bill that did. Unfortunately, the table and the article on which the letter is largely bssed (from Automotive News. September 23, 1985) refer to legislation introduced in 1985 and not the current bill. H.R. 3399, which was adopted by the Energy and Power Subcommittee last week by voice vote, contains two significant changes designed to close the potential loophole.

The basic difference of opinion about the bill is whether tbe nation shduld take a small risk of slightly increased gasoline consumption for a few years, wkile gasoline is relatively cheap and plentiful, in order to create a fleet of dual-fueled cars capable of switching progressively away from gasoline as oil prices start to rise. By providing a CAFE incentive for cars that can run on either of two fuels, H.R. 3399 proposes that we take a small, short-term risk for a large, long-term gain in energy security.

For example, subcommittee staff estimates that even if a generous ten percent of all new GM, Ford and Chrysler cars were converted to dual-fuel capability in a given year, the effective CAFE level allowed on their remaining new cars would drop only 1.5 mpg to 26 mpg. At worst tbis would mean a four tenths of one percent increase in total gasoline consumption if none of them ever ran on methanol. The average fuel efficiency of the total fleet would probably continue to rise, despite this factor, as older cars continue to be replaced.

The opponents of H.R. 3399 exaggerate the short term risk by making unrealistic worst-case assumptions and argue that avoiding this risk is more important than reducing gasoline consumption and oil imports in the long run. Unfortunately, reducing or eliminating this risk would reduce or eliminate the incentive to build dual-fueled cars, the likely transition step to alternative fuels.

Conversion of a significant portion of our automotive fleet to a non-petroleum fuel is the single most important step we can take to reduce oil consumption and improve energy security. It will also improve air quality by reducing emissions of several controlled pollutants. If you would like to know more about the bill, please refer to the October 1 Congressional Record (p. E 3810 et seq.) or ask us about it.

Sincerely

PHIL SHARP and RON WYDEN, *U.S. Representatives.*

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT,
El Monte, CA, September 22, 1987.

Hon. JOHN D. ROCKEFELLER IV,
U.S. Senate, Washington, DC.

DEAR SENATOR ROCKEFELLER: As Chairman of the South Coast Air Quality Management District Board, I am pleased to inform you that the District Board supports your S. 1518. The District Board strongly supports incentives for the development of alternative fuels vehicles because of their potential for emission reductions.

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The air pollution problem in our District—which includes all of the Counties of Los Angeles, Orange, and Riverside and the urban portion of the County of San Bernardino—is so severe that planning for the attainment of the National Ambient Air Quality Standards is extremely difficult, particularly for ozone. If we are ever to achieve our clean air goal, it is essential that we greatly reduce emissions from both mobile and stationary sources. We must reduce our reliance on the more polluting petroleum-based fuels by the use of cleaner burning fuels.

The District Board appreciates your efforts in bringing S. 1518 before the Senate. The District would be happy to present testimony on the air quality benefits of S. 1518 when it is considered in committee.

Sincerely,

NORTON YOUNGLOVE,
Chairman, South Coast District Board.

Steel Tank Institute 728 Anthony Trail
Northbrook, IL 60062
312/498-1980

STI

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November 11, 1987

The Honorable Albert Gore, Jr.
Chairman
Consumer Subcommittee
Committee on Commerce, Science and Transportation
United States Senate
SH-227
Washington, D.C. 20510

Dear Senator:

I am writing in regard to S. 1518, "Methanol and Alternative Fuels Promotion Act", and request that this letter be included as part of the official record of the November 12 hearing on this legislation.

The Steel Tank Institute is a trade association representing about 100 fabricators of underground petroleum storage systems.

STI recognizes the value of S. 1518 for its commendable efforts at taking a first step towards the development of a national fuels policy for America. Recent events in the Mideast again have underscored an urgent need for the United States to be energy independent. Our nation's leaders must develop plans that allow national security to be maintained when turmoil elsewhere threatens oil supplies.

The provisions of the legislation that provide incentives to the major automakers to produce automobiles that are dedicated to methanol or are dual fueled are a significant step towards acceptance and production of alternative fuels.

However, the development and increased use of alcohol-based fuels such as methanol give rise to another key issue: the infrastructure that will store and distribute the fuels.

The proposed legislation should require that all new underground storage tank systems be compatible with fuels blended with as much as 85 percent alcohol.

The problem compatibility affects both steel and fiberglass tanks. Although steel can safely contain methanol, a number of leaking steel tanks have been relined with material that is incompatible with methanol.

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Equally important is the incompatibility of fiberglass reinforced plastic (FRP) and alcohol fuels. Studies show that FRP tanks need a specially formulated resin to prevent tank leaks because of "debonding" of fibers when storing alcohol-based products.

Despite the contentions of some industry representatives, there is no logical way to assert that more time is needed to develop resin technology. We are not in an age that could be mistaken as the dawn of alcohol-blended fuels. Anyone in the industry during the last decade has seen how increased emphasis would be placed on these products.

Presently only a few of the estimated 200,000 FRP tanks in use are capable of holding 85 percent methanol blends. Of the 10,000 FRP tanks that will be sold in the next year, few will be capable of containing methanol.

The problem of compatibility is not limited to fiberglass tanks. Although steel can contain methanol, a number of leaking steel tanks have been relined with material that is incompatible with methanol.

In short, it makes no sense economically or ecologically to enact a policy that promotes alcohol-blended fuels without requiring the necessary infrastructure improvements. The California Energy Commission proposed just such legislation in the recent session of the California legislature.

In addition, now is the perfect time for the Congress to act on this measure. The Environmental Protection Agency is finalizing regulations for underground storage tanks which will prompt tank replacements over the next ten years. It makes sense to coordinate the efforts of the EPA with this legislation so that as tanks are replaced compatible tanks go into the ground.

The interests of the country's energy and environmental policies will be advanced with a requirement that all new underground storage tank systems be capable of storing all alcohol fuels.

Thank you for your time and consideration.

Sincerely,

Brian C. Donovan
Executive Vice President

cc: Senate Commerce Committee Members

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OFA OXYGENATED FUELS ASSOCIATION, INC.
1330 CONNECTICUT AVENUE, N.W., #300, WASHINGTON, D.C. 20036 1702 • (202) 659 0060

October 7, 1987

The Honorable Jay D. Rockefeller, IV
724 Senate Hart Office Building
Washington, DC 20515

Re: S. 1518 "Methanol and Alternative Fuels Promotion Act of 1987"

Dear Senator Rockefeller:

On behalf of the Oxygenated Fuels Association I would first of all like to commend and congratulate you and your staff on introducing S. 1518. As you know, our association, which is comprised of the major manufacturers of methanol and MIBE (list of which is attached), has long advocated the use of oxygenated fuels.

We are gratified to see the introduction of S. 1518 and it is OFA's position that, in the long term, it is essential to meeting our energy and environmental goals that we utilize an alternative fuel through the application of technology that will ultimately allow the use of coal in the production of a clean burning liquid alternative fuel.

We feel that methanol represents such an alternative and on behalf of the Oxygenated Fuels Association wish to indicate our support for S. 1518.

Sincerely,

George S. Dominguez
Executive Director

Renewable FUELS

Renewable Fuels Association
201 Massachusetts Avenue, N.E.
Suite C-4
Washington, DC 20002
(202) 543 5802
TELEFAX: (202) 543-6925

Eric Vaughn
President/Chief Executive Officer

August 6, 1987

The Honorable John D. Rockefeller IV
United States Senate
Washington, D.C. 20510

Dear Senator Rockefeller:

On behalf of the members of the Renewable Fuels Association, the national trade association for the domestic ethanol industry, I want to congratulate you on the introduction of S. 1518, the "Methanol and Alternative Fuels Promotion Act of 1987."

Your bill will provide the necessary incentives for U.S. automakers to manufacture vehicles capable of operating on neat or nearly neat alcohol fuels. As you know, General Motors, Ford and other automakers have produced millions of automobiles over the past eight years in Brazil designed to run on 100% ethanol. Major auto manufacturing companies have perfected alcohol fuel vehicles and sell these exceptionally high quality - high performance automobiles to highly satisfied consumers in Brazil today.

The Rockefeller bill will provide American consumers with an opportunity to purchase an automobile designed to operate on clean burning alcohol fuels. Those automobiles will help clean up the air we breathe and create markets for alternative fuels.

The Renewable Fuels Association is an enthusiastic supporter of S. 1518 and will work with you, and other Members of Congress to secure passage of this important legislation. We commend you for your leadership on alternative fuels development in the United States and we applaud your commitment to finding new solutions to our environmental, national energy security and economic development challenges.

With best regards, I am

Sincerely,

Eric Vaughn
President

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AGA American Gas Association

1515 Wilson Boulevard, Arlington, Va. 22209
Telephone (703) 841-8610

Michael Baly III
Vice President
Government Relations

July 16, 1987

Honorable John D. Rockefeller, IV
United States Senate
Washington, D.C. 20510

Dear Senator Rockefeller:

We commend you for introducing legislation to promote the development of alternative automotive fuels. Bill Gordon of my staff has worked with Bill Ichord on this issue and we are extremely pleased your bill would provide CAFE credits for natural gas vehicles. I believe your proposal will serve both your state and the nation well. As you know, West Virginia is rich in gas reserves as well as having abundant coal resources.

A.G.A. endorses your bill because it provides the fairest and most effective approach for reducing our consumption of imported oil. The potential market demand for alternative transportation fuels is enormous. There is clearly a large market opportunity for all alternative fuels (methanol, ethanol and natural gas), and I am sure your legislation will benefit all of these fuels. Imported oil will be displaced more expeditiously, and with minimal impact on consumers, if government incentives are provided for all alternative fuels and the marketplace determines which fuel prevails under various circumstances. You have recognized this by providing CAFE credits for all nonpetroleum fuels.

I am aware of the provision in your bill which gives the Secretary of Energy authority to take necessary steps to ensure residential gas customers are not adversely affected by your bill. I can appreciate your wanting to provide such assurances to your constituents. A.G.A. is confident this problem will not arise because gas sales in the transportation sector will be relatively small. Under the most optimistic scenario, the gas industry hopes to market approximately one million NGVs by the year 2010. Even at today's low consumption rate for natural gas, these one million NGVs would only increase domestic gas consumption by six-tenths of one percent.

Substitution of nonpetroleum fuels for gasoline will serve many important national interests. Our national security and trade balance will both improve if we reduce our dependence on imported oil. Switching to nonpetroleum fuels will also contribute to cleaner air. We appreciate your leadership on this issue and will continue to work closely with your staff.

Respectfully,

Mike

Michael Baly III

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STATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

CALIFORNIA ENERGY COMMISSION
CHARLES R. IMBRECHT
Chairman

August 4, 1987

The Honorable John D. Rockefeller IV
United States Senate
SH-724 Hart Senate Office Building
Washington, DC 20510-4802

Dear Senator Rockefeller:

The California Energy Commission (CEC) has been on record since 1984 in support of legislation which embodies the concepts of S1518. We commend your efforts to promote the use of alternative fuels through this legislation.

The CEC views this legislation, not as a retreat from the original goals of Corporate Average Fuel Economy Standards (CAFE), but as an investment in the future. Energy conservation and use of alternative fuels are complementary, in that they both seek to reduce our country's reliance on petroleum fuels and enhance our energy security. Use of clean, alternative fuels can provide the necessary emission reductions to enable areas throughout the nation to improve air quality.

For many years, California has promoted low emission fuels and fuels which can reduce our dependence on imported oil. The alternative fuels included in your bill, -- ethanol, methanol and natural gas, --can help achieve these goals.

California's transportation system is 99 percent dependent on petroleum-based fuels, consuming 74 percent of the state's annual petroleum supply. Crude oil imports are expected to represent 50 percent of the nation's oil demand by the mid-1990s. Furthermore, California's major urban areas will not meet federal air quality standards by the December 31, 1987 deadline. Alternative fuels can help reach the state's air quality goals and improve California's energy security.

The California Energy Commission's alternative fuels program started in 1978 with field evaluation of relatively small volumes of alcohol fuels blended with gasoline. At present, the CEC oversees the demonstration of over 500 methanol-powered Ford Escorts. California recently received seven of Ford Motor Company's Flexible Fuel Vehicles (FFV). The FFV's are capable of operating on alcohol fuel, gasoline, or any blend of the two. In addition, we look forward to the arrival of a Chevrolet Corsica Variable Fuel Vehicle (General Motors' version of an FFV) later this year.

1516 9th Street, Sacramento, CA 95814 (916) 324-3774

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We consider the FFV's to represent the current state-of-the-art in alcohol cars. However, there are still problems mass marketing these vehicles and providing convenient fuel supplies for them. The CEC recently received $5 million in Petroleum Violation Escrow Account (PVEA) funds to expand our methanol vehicle demonstrations. Half of the funds are committed to heavy-duty methanol engine demonstrations in the transit and trucking industries. The remaining $2.5 million will be used for light-duty methanol vehicle demonstrations. This will include expansion of the existing refueling network and a large-scale demonstration of FFV technology. The CEC recently announced a public/private partnership with the Atlantic Richfield Company (ARCO), one of the largest gasoline retailers in the western United States, which will add at least 25 methanol fueling stations added to the existing 20-station network. We are involved in similar negotiations with Chevron, USA and Exxon. We anticipate these negotiations will result in additional stations and provide research assistance to the methanol program.

The need for energy security and air quality improvements in this country requires that government encourage the use of alternative transportation fuels. California has a demonstrated commitment to methanol, but to expand this effort will require the assistance of the federal government.

We feel that your legislation can provide the impetus to vehicle manufacturers to pursue production of methanol-fueled vehicles. This, in turn, will encourage the methanol fuel industry to more vigorously enter the marketplace. This legislation will also move us closer to our goals of reducing our consumption of petroleum fuels and diversifying our energy resource base.

Let us know how we can assist in your pioneering efforts.

Sincerely,

CHARLES R. IMBRECHT
Chairman

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